EXERCISE – I (Conceptual Question) **Build Up your Understanding**

ELECTRIC CURRENT & DRIFT VELOCITY

1. If 10^6 electrons/s are flowing through an area of cross section of 10^{-4} m^2 then the current will be :
(1) 1.6×10^{-7} A (2) 1.6×10^{-13} A (3) 1×10^{-6} A (4) 1×10^2 A

2. The current in a conductor varies with time t as $I = 2t + 3t^2$ A where I is amperes and t in seconds. Electric charge flowing through a section of the conductor during t = 2s to t = 3s is :-
(1) 10 C (2) 24 C (3) 33 C (4) 44 C

3. 10,000 electrons are passing per minute through a tube of radius 1 cm. The resulting current is :
(1) 10000 A (2) 0.25×10^{-16} A (3) 10^{-9} A (4) 0.5×10^{-19} A

4. There are 8.4×10^{22} free electrons per cm^3 in copper. The current in the wire is 0.21 A ($e = 1.6 \times 10^{-19}$ C). Then the drifts velocity of electrons in a copper wire of 1 mm^2 cross section, will be :-
(1) 2.12×10^{-5} m/s (2) 0.78×10^{-5} m/s (3) 1.56×10^{-5} m/s (4) none of these

5. There is a current of 40 amperes in a wire of 10^{-6} m^2 area of cross-section. If the number of free electrons per m^3 is 10^{29}, then the drift velocity will be
(1) 1.25×10^3 m/s (2) 2.50×10^{-3} m/s (3) 25.0×10^{-3} m/s (4) 250×10^{-3} m/s

6. S.I. unit of current is :
(1) C (2) A (3) A/s (4) N/s

7. When no current flows through a conductor :
(1) the free electrons do not move
(2) the average speed of a free electron over a large period of time is zero
(3) the average velocity of a free electron over a large period of time is zero
(4) the average of square of velocities of all the free electrons at an instant is zero

8. A steady current flows in a metallic conductor of non-uniform cross-section. The quantity/quantities which remain constant along the length of the conductor is/are
(1) current, electric field and drift velocity (2) drift speed only
(3) current and drift speed (4) current only

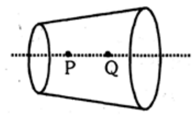
9. The number of free electrons per 10 mm of an ordinary copper wire is about 2×10^{21}. The average drift speed of the electrons is 0.25 mm/s The current flowing is :
(1) 0.8 A (2) 8 A (3) 80 A (4) 5 A

10. In a Neon discharge tube 2.9×10^{18} Ne^+ ions move to the right each second, while 1.2×10^{18} electrons move to the left per second; electron charge is 1.6×10^{-19} C. The current in the discharge in the discharge tube is :
(1) 1 A towards right (2) 0.66 A towards right
(3) 0.66 A towards left (4) zero

11. Two wires each of radius of cross section r but of different materials are connected together end to end (in series).1f the densities of charge carriers in the wires are in the ratio 1:4, the drift velocity of electrons in the two wires will be in the ratio :
(1) 1 : 2 (2) 2 : 1 (3) 4 : 1 (4) 1 : 4

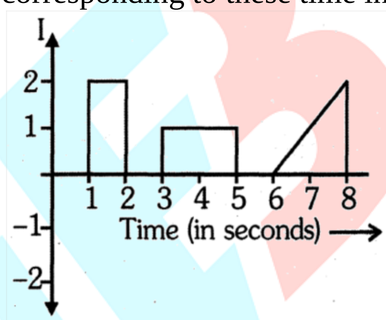
12. A current I flows through a uniform wire of diameter d when the electron drift velocity is v. The same current will flow through a wire of diameter d/2 made of the same material if the drift velocity of the electrons is
(1) v/4 (2) v/2 (3) 2v (4) 4v

13. A wire has a non-uniform cross-section as shown in figure. A steady current flows through it. The drift speed of electrons at points P and Q is v_P and v_Q, then :-



(1) $v_P = v_Q$ (2) $v_P < v_Q$ (3) $v_P > v_Q$ (4) data is insufficient

14. The plot represents the flow of current through a wire for different time intervals. The ratio of charge flowing through the wire corresponding to these time intervals is (see figure) :-



(1) 2 : 1 : 2 (2) 1 : 3 : 3 (3) 1 : 1 : 1 (4) 2 : 3 : 4

OHM'S LAW & ELECTRICAL RESISTANCES

15. Three copper wires are there with lengths and cross-sectional areas as (λ, A); $\left(2l, \frac{A}{2}\right)$ and $\left(\frac{l}{2}, 2A\right)$. Resistance :-

(1) minimum for the wire of cross-sectional are $\frac{A}{2}$
(2) minimum for the wire of cross-sectional are A
(3) minimum for the wire of cross-sectional area 2A
(4) same for all the three cases.

16. A wire of uniform cross-section a, length λ and resistance R is bent into a complete circle; the resistance between any two of diametrically opposite points will be :
(1) $\frac{R}{2}$ (2) $\frac{R}{4}$ (3) $\frac{R}{8}$ (4) 4R

17. The electric resistance of a certain wire of iron if R. If its length and radius both are doubled, then:-

(1) the resistance will be halved and the specific resistance will remain unchanged

(2) the resistance will be halved and the specific resistance will be doubled

(3) the resistance and the specific resistance, will both remain unchanged

(4) the resistance will be doubled and the specific resistance will be halved.

18. When a piece of aluminium wire of finite length is drawn to reduce its diameter to half its original value, its resistance will become :

(1) two times (2) four times (3) eight times (4) sixteen times

19. As the temperature of a metallic resistor is increased, the product of resistivity and conductivity:

(1) increases (2) decreases

(3) may increase or decrease (4) remains constant.

20. If a wire is stretched, so that its length is 20% more than its initial length, the percentage increase in the resistance of the wire is :-

(1) 40% (2) 10% (3) 44% (4) 25%

21. The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the charge in the resistance of the wire will be :-

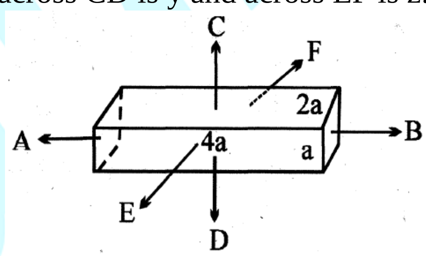
(1) 300% (2) 200% (3) 100% (4) 50%

22. On increasing the temperature, the specific resistance of a conductor and a semiconductor

(1) both increase (2) both decrease

(3) increases and decreases respectively (4) decreases and increases respectively

23. A conductor with rectangular cross section has dimensions ($a \times 2a \times 4a$) as shown in figure. Resistance across AB is x, across CD is y and across EF is z. Then



(1) $x = y = z$ (2) $x > y > z$ (3) $y > x > z$ (4) $x > z > y$

24. Specific resistance of a conductor increases with :

(1) increase in temperature

(2) increase in cross-sectional area

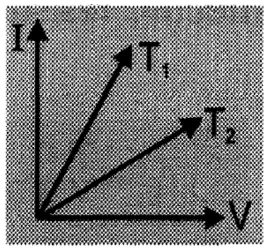
(3) increase in cross-sectional area and decrease in length.

(4) decrease in cross-sectional area.

25. The temperature coefficient of resistance of a wire is 0.00125 per degree Celsius. At 300 K its resistance is 1 ohm. The resistance of the wire will be 2 ohms at a temperature :

(1) 1154 K (2) 1127 K (3) 600 K (4) 1400 K

26. The current voltage graph for a given metallic conductor at two different temperatures T_1 and T_2 are as shown in the figure. Then :-



(1) $T_1 > T_2$ (2) $T_1 = T_2$
(3) Nothing can be said about T_1 and T_2 (4) $T_1 < T_2$

27. The effective resistance is $\frac{6}{5}$ Ω, when two wires are joined in parallel. When one of the wire breaks, the effective resistance is 2 ohms. The resistance of the broken wire was :
(1) $\frac{3}{5}\Omega$ (2) 2 Ω (3) $\frac{6}{5}\Omega$ (4) 3 Ω

28. At what temperature will the resistance of a copper wire become three times its value at 0°C ? [Temperature coefficient of resistance for copper = 4×10^{-3} per °C] :-
(1) 400° C (2) 450° C (3) 500° C (4) 600° C

29. Copper and silicon are cooled from 300 K to 60 K; the specific resistance :
(1) decreases in copper but increases in silicon
(2) increases in copper but decreases in silicon
(3) increases in both
(4) decreases in both

30. Two resistances R_1 and R_2 are made of different materials. The temperature coefficient of the material of R_1 is a and that of the material of R_2 is -β. The resistance of the series combination of R_1 and R_2 does not change with temperature, then the ratio of resistances of the two wires at OCC will be :
(1) $\frac{\alpha}{\beta}$ (2) $\frac{\alpha+\beta}{\alpha-\beta}$ (3) $\frac{\alpha^2+\beta^2}{\alpha\beta}$ (4) $\frac{\beta}{\alpha}$

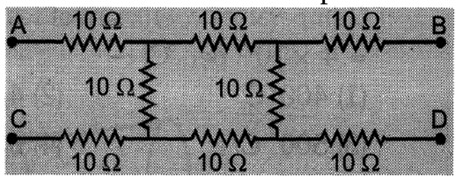
COMBINATION OF RESISTANCES & KIRCHHOFF'S LAW

31. A metal wire of resistance R is cut into three equal pieces which are then connected side by side to form a new wire, the length of which is equal to one third of the original length. The resistance of this new wire is :
(1) R (2) 3R (3) $\frac{R}{9}$ (4) $\frac{R}{3}$

32. Three resistances of values 2Ω, 3Ω and 6 Ω are to be connected to yield an effective resistance of 4 Ω. This can be done by connecting :
(1) 3Ω resistance in series with a parallel combination of 2Ω and 6Ω
(2) 6Ω resistance in series with a parallel combination of 2Ω and 3Ω
(3) 2Ω resistance in series with a parallel combination of 3Ω and 6Ω

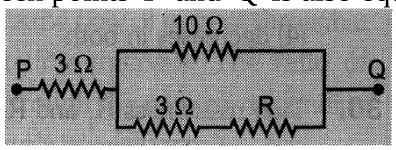
(4) 2Ω resistance in parallel with a parallel combination of 3Ω and 6Ω

33. What will be the equivalent resistance between the points A and D ?



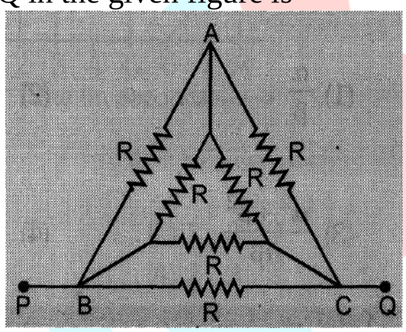
(1) 10 Ω (2) 20 Ω (3) 30 Ω (4) 40 Ω

34. In the circuit shown here, what is the value of the unknown resistance R so that the total resistance of the circuit between points 'P' and 'Q' is also equal to R:



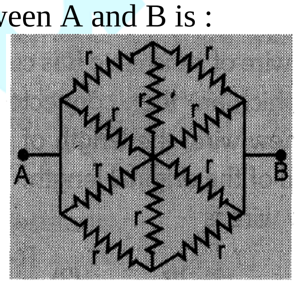
(1) 30 (2) $\sqrt{39}\Omega$ (3) $\sqrt{69}\Omega$ (4) 10 Ω

35. The resistance across P and Q in the given figure is



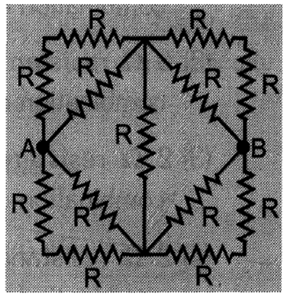
(1) $\frac{R}{3}$ (2) $\frac{R}{2}$ (3) 2R (4) 6R

36. The resistance of the circuit between A and B is :



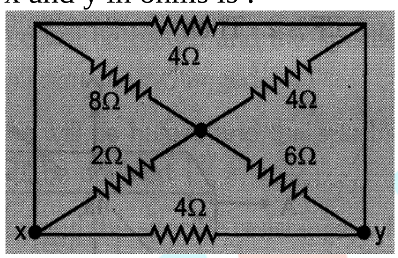
(1) r (2) 0.5r (3) 2r (4) 3r

37. Thirteen resistances each of resistance RΩ are connected in the circuit as shown in the figure. The effective resistance between A and B is :



(1) $\frac{4R}{3}\Omega$ (2) 2RΩ (3) R Ω (4) $\frac{2R}{3}\Omega$

38. The total resistance between x and y in ohms is :-

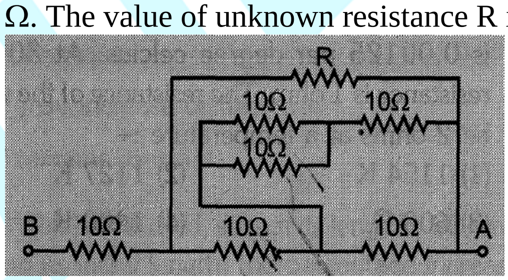


(1) 1 Ω (2) 4 Ω (3) $\frac{4}{3}$ Ω (4) $\frac{2}{3}$Ω

39. The resultant resistance of n wires each of resistance r ohms is R, when they are connected in parallel. When these n resistances are connected in series, the resultant resistance will be :

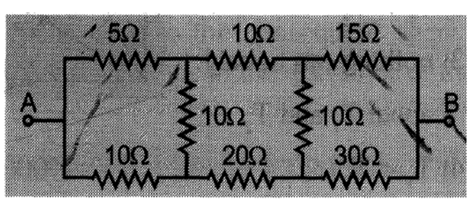
(1) $\frac{R}{n}$ (2) $\frac{R}{n^2}$ (3) nR (4) n^2R

40. For the network of resistance shown in the fig. the equivalent resistance of the network between the points A and B is 18 Ω. The value of unknown resistance R is :



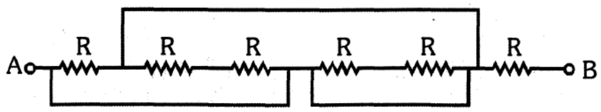
(1) 8 Ω (2) 10 Ω (3) 16 Ω (4) 24 Ω

41. In the arrangement of resistances shown below, the effective resistance between points A and B is :



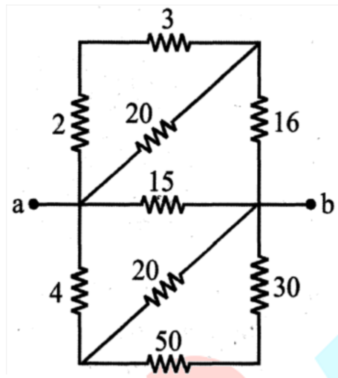
(1) 20 Ω (2) 30 Ω (3) 90 Ω (4) 110 Ω

42. In the circuit shown the equivalent resistance between A and B is



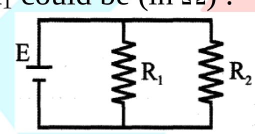
(1) R (2) 2R/5 (3) R/3 (4) 2R

43. In the figure the numerical values denote resistance in SI units. The total resistance of the circuit between a & b will be :



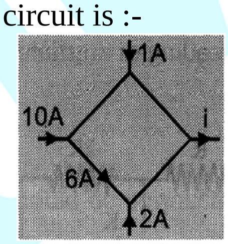
(1) 12 ohms (2) 24 ohms (3) 15 ohms (4) 6 ohms

44. Resistors R_1 and R_2 have an equivalent resistance of 6 ohms when connected in the circuit shown below. The resistance of R_1 could be (in Ω) :



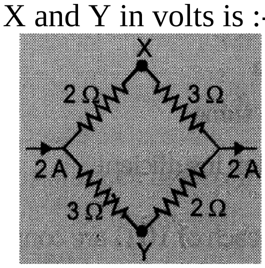
(1) 1 (2) 5 (3) 8 (4) 4

45. Value of current I in the following circuit is :-



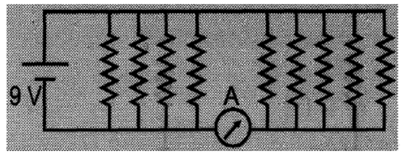
(1) 13 A (2) 12 A (3) 9 A (4) none of the above

46. The potential difference between X and Y in volts is :-



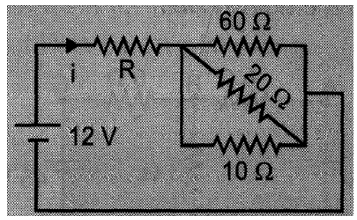
(1) 1 (2) –1 (3) 2 (4) –2

47. If each resistance in the fig. is 9 Ω then reading of the ammeter is :-



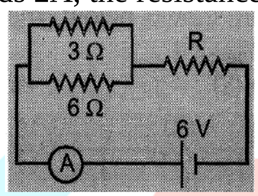
(1) 5A (2) 8A (3) 2A (4) 9A

48. If i = 0.25 A in figure, then value of R is :-



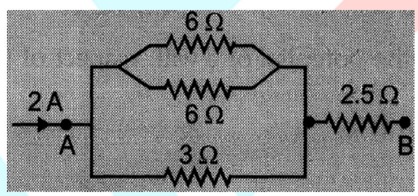
(1) 48 Ω (2) 12 Ω (3) 120 Ω (4) 42 Ω

49. If the ammeter in the given circuit reads 2A, the resistance R is :-



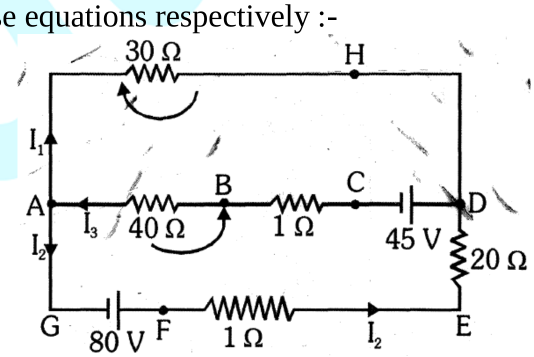
(1) 1 ohms (2) 2 ohms (3) 3 ohms (4) 4 ohms

50. The equivalent resistance and potential difference between A and B for the circuit are respectively :-



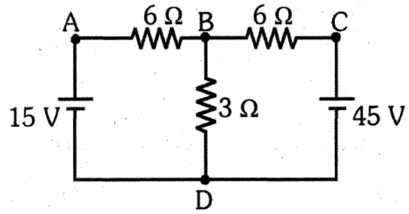
(1) 4 Ω, 8 V (2) 8 Ω, 4 V (3) 2 Ω, 2 V (4) 16 Ω, 8 V

51. For the current loops shown in the figure, Kirchhoff 's loop rule for the loops AHDCBA and AHDEFGA yields these equations respectively :-



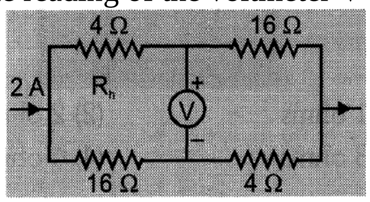
(1) $-30\ I_1 - 41\ I_3 + 45 = 0$ and $-30\ I_1 + 21\ I_2 - 80 = 0$
(2) $30\ I_1 - 41\ I_3 + 45 = 0$ and $30\ I_1 + 21\ I_2 - 80 = 0$
(3) $30\ I_1 + 41\ I_3 - 45 = 0$ and $-30\ I_1 + 21\ I_2 + 80 = 0$
(4) $-30\ I_1 - 41\ I_3 - 45 = 0$ and $-30\ I_1 + 21\ I_2 - 80 = 0$

52. In the circuit shown in figure, find the current through the branch BD.



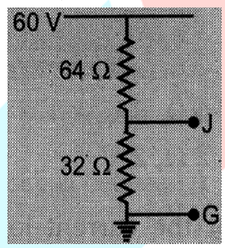
(1) 1 A (2) 5 A (3) 3 A (4) 7 A

53. In the circuit shown below, the reading of the voltmeter V is :-



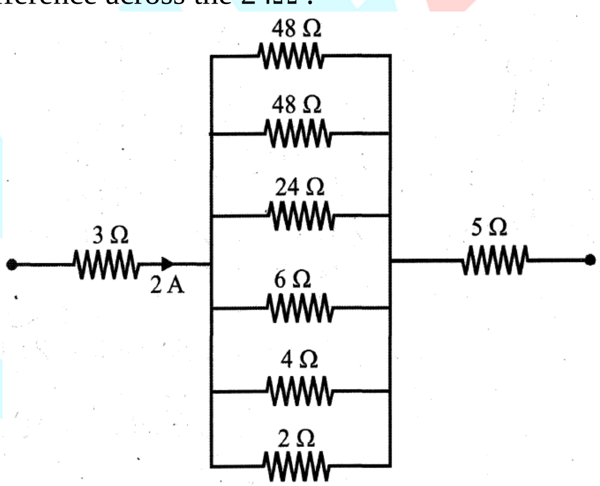
(1) 12 V (2) 8 V (3) 20 V (4) 16 V

54. Find the potential of J with respect of G:



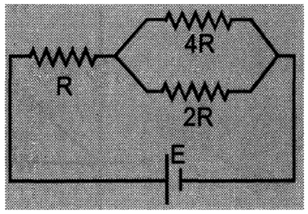
(1) 40 V (2) 60 V (3) 20 V (4) 30 V

55. Find the potential difference across the 24Ω :-



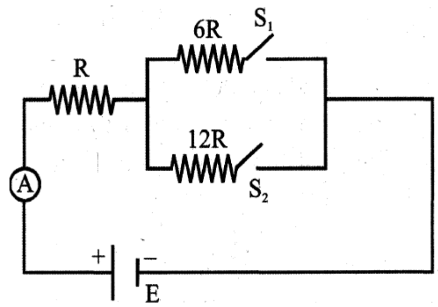
(1) 48 volts (2) 2 volts (3) 4 volts (4) 1 volts

56. In a network as shown in the figure the potential difference across the resistance 2R is (the cell has an emf E with no internal resistance) :



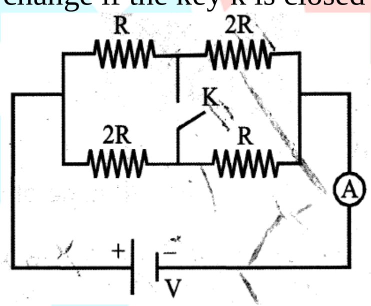
(1) 2E (2) $\frac{4E}{7}$ (3) $\frac{E}{7}$ (4) E

57. The reading of ammeter is I_1 when only S_1 is closed and I_2 when only S_2 is closed. The reading is I_3 when only S_2 is closed. The reading is I_3 when both S_1 & S_2 are closed simultaneously then:



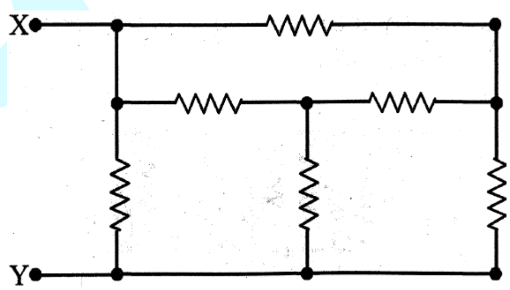
(1) $I_1 > I_2 > I_3$ (2) $I_2 > I_3 > I_1$ (3) $I_3 > I_2 > I_1$ (4) $I_3 > I_1 > I_2$

58. How will the reading of ammeter change if the key k is closed ?



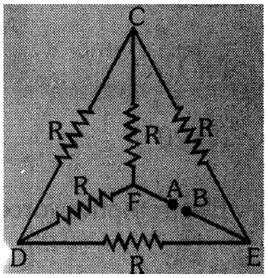
(1) increase (2) Decrease (3) Remains same (4) Information insufficient

59. Six resistors each of 10Ω are connected as shown. The equivalent resistance between points X and Y is :



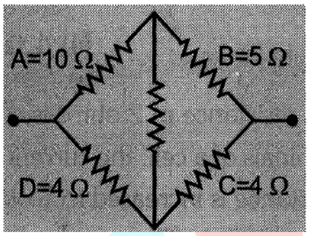
(1) 20 Ω (2) 5 Ω (3) 25/3 Ω (4) 10 Ω

60. Five equal resistances each of resistance R are connected as shown in the Figure. A battery of voltage V is connected between A and B. The current flowing in AFCEB will be



(1) $\frac{V}{R}$ (2) $\frac{V}{2R}$ (3) $\frac{2V}{R}$ (4) $\frac{3V}{R}$

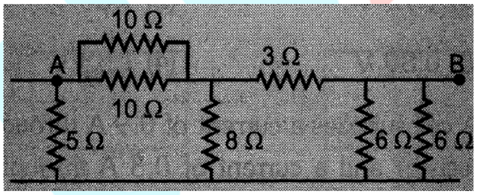
61. In a typical Wheatstone bridge the resistance in cyclic order are A = 10 Ω, B = 5 Ω, C = 4 Ω and D = 4 Ω. For the bridge to be balanced :



(a) 10 n should be connected in parallel with A
(b) 10 n should be connected in series with A
(c) 5 n should be connected in series with B
(d) 5 n should be connected in parallel with B

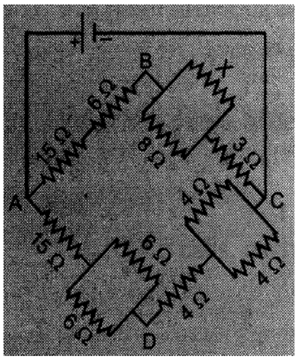
(1) a, b (2) b, c (3) a, c (4) all

62. Seven resistances are connected as shown in the figure. The equivalent resistance between A and B is:



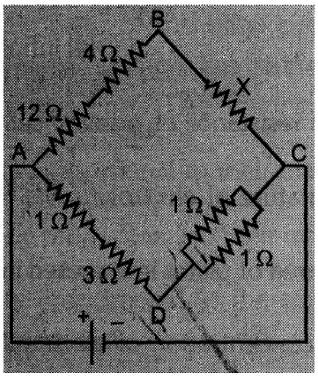
(1) 3 Ω (2) 4 Ω (3) 4.5 Ω (4) 5 Ω

63. In the following circuit diagram the value of resistance X for the potential difference between B and D to be zero is :-



(1) 4 ohms (2) 6 ohms (3) 8 ohms (4) 9 ohms

64. In the arrangement of resistances shown in the circuit, the potential difference between points Band D will be zero, when the unknown resistance X is:

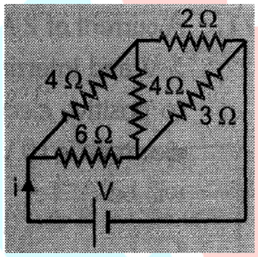


(1) 4 Ω (2) 3 Ω (3) 2 Ω (4) 1 Ω

65. The resistance of each arm of a wheat stone bridge is 10 Ω. A resistance of 10 Ω is connected in series with the galvanometer then the equivalent resistance across the battery will be :-

(1) 10 Ω (2) 15 Ω (3) 20 Ω (4) 40 Ω

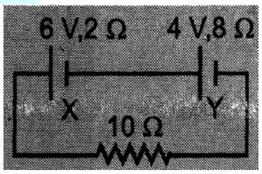
66. For the network shown in the figure the value of the current i is :-



(1) $\frac{18V}{5}$ (2) $\frac{5V}{9}$ (3) $\frac{9V}{35}$ (4) $\frac{5V}{18}$

CELLS & COMBINATION OF CELLS, ELECTRIC POWER & ENERGY

67. Two cells X and Y are connected to a resistance of l0 Ω as shown in the figure. The terminal voltage of cell Y is:



(1) zero (2) 2 v (3) 4 v (4) 10 v

68. A battery has e.m.f. 4 V and internal resistance 'r'. When this battery is connected to an external resistance of 2 ohms, a current of 1 A flows in the circuit. What current will flow if the terminals of the battery are connected directly ?

(1) 1 A (2) 2 A (3) 4 A (4) infinite

69. Internal resistance of primary cell depends on :

(1) the nature of electrolyte

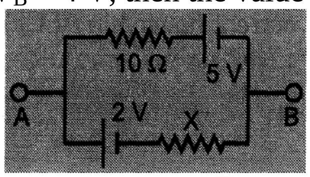
(2) the area of plates immersed in the electrolyte

(3) the concentration of electrolyte and distance between the plates
(4) all the above

70. The potential difference between the terminals of a cell is found to be 3 volts when it is connected to a resistance of value equal to its internal resistance. The e.m.f. of the cell is :-
(1) 3 V (2) 6 V (3) 1.5 V (4) 4.5 V

71. A current of 2 A is flowing through a cell of e.m.f. 5 V and internal resistance 0.5 Ω from negative to positive electrode. If the potential of negative electrode is 10 V, the potential of positive electrode will be :-
(1) 5 V (2) 14 V (3) 15 V (4) 16 V

72. In the following circuit if $V_A - V_B = 4$ V, then the value of resistance X in ohms will be :



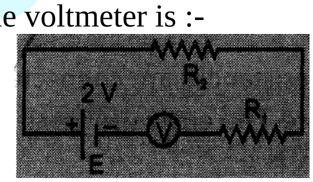
(1) 5 (2) 10 (3) 15 (4) 20

73. Electromotive force of a cell is basically a
(1) force (2) power (3) work (4) current capacity

74. The terminal voltage is $\frac{E}{2}$ when a current of 2 A is flowing through 2 Ω resistance; the internal resistance of the cell is :
(1) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω

75. When a resistance of 2 ohms is connected across the terminals of a cell, the current is 0.5 A. When the resistance is increased to 5 ohms, the current becomes 0.25 A. The e.m.f. of the cell is :
(1) 1.0 V (2) 1.5 V (3) 2.0 V (4) 2.5 V

76. A cell of e.m.f 2V and negligible internal resistance is connected to resistors R_1 and R_2 as shown in the figure. The resistance of the voltmeter R_1 and R_2 are 80Ω, 40Ω, and 80Ω respectively. The reading of the voltmeter is :-



(1) 1.78 V (2) 1.60 V (3) 0.80 V (4) 1.33 V

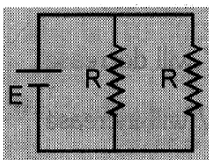
77. A cell supplies a current of 0. 9 A through a 2 Ω resistor and a current of 0.3 A thro1-1gh a 7 Ω resistor. The internal resistance of the cell is :
(1) 1.0 Ω (2) 0.5 Ω (3) 2.0 Ω (4) 1.2 Ω

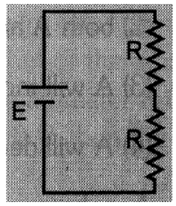
78. A 10 V battery with internal resistance 0.5 Ω is connected across a variable resistance R. The value or R for which the power delivered to it is maximum, is equal to :-
(1) 0.5 Ω (2) 1 Ω (3) 1.5 Ω (4) 2 Ω

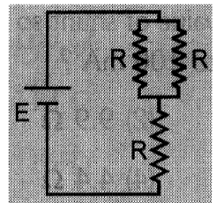
79. An electric bulb is designed to draw a power P_0 at voltage V_0. If the voltage is V, it draws a power P, then -

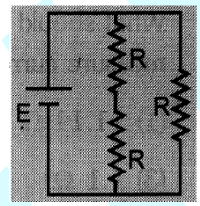
(1) $P = \left(\frac{V}{V_0}\right)P_0$ (2) $P = \left(\frac{V_0}{V}\right)P_0$ (3) $P = \left(\frac{V_0}{V}\right)^2 P_0$ (4) $P = \left(\frac{V}{V_0}\right)^2 P_0$

80. Consider the four circuits shown in, the figure below. In which circuit power dissipated. maximum (Neglect the internal resistance of the power supply)

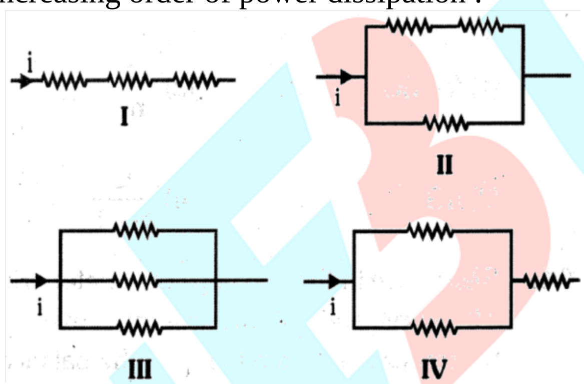
(1) 

(2) 

(3) 

(4) 

81. Three resistances of equal value are arranged in different combinations as shown below. Arrange them in the increasing order of power dissipation :



(1) III < II < IV < I (2) II < III < IV < I (3) I < IV < III < II (4) I < III < II < IV

82. 25 W, 200 V and 100 W, 200 V bulbs are connected in series to a source of 400 volts. Which bulb will fuse ?

(1) 25 W (2) 100 W
(3) Both will fuse at the same time (4) None of the bulbs will fuse

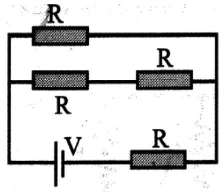
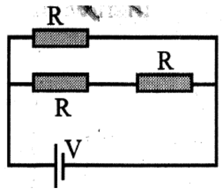
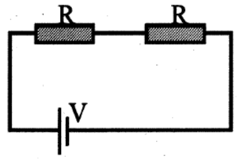
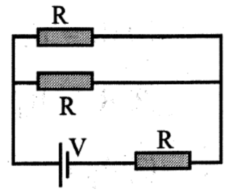
83. You are provided with 48 cells, each of emf 2 volts and internal resistance 4 ohms. What maximum current can flow in the circuit having an external resistance of 12Ω ?

(1) 1 A (2) 1.2 A (3) 0.96 A (4) 1.08 A

84. Two electric bulbs of the same power, but with different marked voltages are connected in series across a power line. Their brightness will be :-

(1) Directly proportional to their marked voltages
(2) Inversely proportional to their marked voltages
(3) Directly proportional to squares their marked voltages
(4) Inversely proportional to the squares of their marked voltages

85. Four circuits are shown below. All the batteries have the same voltage V and all resistors have the same resistance R. In which circuit does the battery delivers the most power?

(1)  (2)  (3)  (4) 

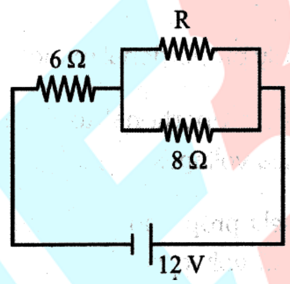
86. Four wires of the same diameter are connected, in turn, between two points maintained at a constant potential difference. Their resistivities and length are respectively; ρ and L (wire 1), 1.2 ρ and 1.2 L (wire 2), 0.9 ρ and 0.9 L (wire 3), and ρ 1.5 L (wire 4). Rank the wires according to the rates at which energy is dissipated as heat, greatest first :-

(1) 4 > 3 > 1 > 2 (2) 4 > 2 > 1 > 3 (3) 1 > 2 > 3 > 4 (4) 3 > 1 > 2 > 4

87. Two cells, each of e.m.f. E and internal resistance r, are connected in parallel across a resistor R. The power dissipated in the resistor in maximum if :

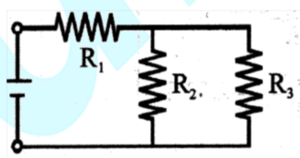
(1) R = r (2) R = 2r (3) $R = \frac{3r}{2}$ (4) $R = \frac{r}{2}$

88. In the circuit shown in figure, the power which is dissipated as heat in the 6 n resistor is 6 W. What is the value of resistance R in the circuit ?



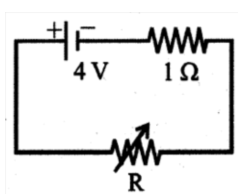
(1) 6 Ω (2) 10 Ω (3) 13 Ω (4) 24 Ω

89. If power consumptions in R_1, R_2 & R_3 are the same then what Will be the relation between them ?



(1) $R_1 = R_2 = R_3$ (2) $R_2 = R_3 = 2R_1$ (3) $R_2 = R_3 = 4R_1$ (4) $R_1 = R_2 = 4R_3$

90. For different values of resistance, R power consumptions in R are given. Then which of the following values are not possible ?



(a) 2 W (b) 5 W (c) 8 W (d) 4 W

(1) Only C (2) b & c (3) a, b, c (4) All

MEASURING DEVICES

91. An ammeter and a voltmeter are joined in series to a cell. Their readings are A and V respectively. If a resistance is now joined in parallel With the voltmeter

(1) both A and V Will decrease (2) both A and V will increase
(3) A Will increase, V will decrease (4) A will decrease, V will increase

92. A galvanometer of 100 Ω resistance yields complete deflection when 100 mA current flows. What should be the value of shunt so that it can measure currents upto 100 mA?

(1) 11.11 Ω (2) 9.9 Ω (3) 1.1 Ω (4) 4.4 Ω

93. In orlder to change the range of a galvanometer of G Ω resistance in Ω connected in series with it :-

(1) (n -1) G (2) $\frac{G}{n}$ (3) nG (4) $\frac{G}{n-1}$

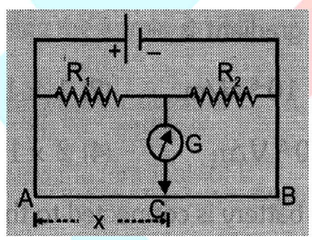
94. Resistance in the two gaps of a meter bridge are 10 ohms and 30 ohms respectively. If the resistances are interchanged, the balance point shifts by:

(1) 33.3 cm (2) 66.67 cm (3) 25 cm (4) 50 cm

95. A galvanometer acting as a voltmeter will have :

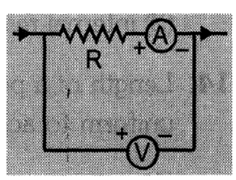
(1) a high resistance in series with its coil (2) a low resistance in parallel with its coil
(3) a low resistance in series with its coil (4) a high resistance in parallel with its coil

96. In the shown arrangement of the experiment of a meter bridge if AC, corresponding to null deflection of galvanometer, is x then what would be its value if the radius of the wire AB is doubled :



(1) x (2) $\frac{x}{4}$ (3) 4x (4) 2x

97. In the following circuit, the resistance of the voltmeter is 10,000 Ω and that of the ammeter is 20 Ω. If the reading of the ammeter is 0.1 A and that of the voltmeter is 12 V, then the value of R is :



(1) 122 Ω (2) 100 Ω (3) 118 Ω (4) 116 Ω

98. The resistance of a galvanometer is G ohms and the range is 1 volt. The value of resistance (in Ω) used to convert it into a voltmeter of range 10 volts is :

(1) 9 G (2) G (3) $\frac{1}{9}$G (4) 10 G

99. A galvanometer has 36 Ω resistance. If a 4 Ω shunt is added to this, the fraction of current that passes through the galvanometer is :

(1) $\frac{1}{4}$ (2) $\frac{1}{9}$ (3) $\frac{1}{10}$ (4) $\frac{1}{40}$

100. A galvanometer of resistance 100 Ω gives full defection for a current of 10^{-5} A. The value of shunt required to convert it into an ammeter of range 1 ampere, is :-

(1) 1 Ω (2) 10^{-3} Ω (3) 10^{-5} Ω (4) 100 Ω

101. There are three voltmeters of the same range but of resistances 10000 Ω, 8000 Ω and 4000 Ω respectively. The best voltmeter among these is the one whose resistance is :-

(1) 10000 Ω (2) 8000 Ω (3) 4000 Ω (4) all are equally good

102. 20% of the main current passes through the galvanometer. If the resistance of the galvanometer is G, then the resistance of the shunt will be

(1) $\frac{G}{50}$ (2) $\frac{G}{4}$ (3) 50 G (4) 9 G

103. A voltmeter of 998 ohms resistance is connected to a cell of emf 2 volts, having internal resistance of 2 ohms, The error in measuring emf will be :-

(1) 4×10^{-1} V (2) 2×10^{-3} V (3) 4×10^{-3} V (4) 2×10^{-1} V

104. An unknown resistance R_1 is connected in series with a resistance of 10 Ω. This combination is connected to one gap of a meter bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 cm. Now, when the l0 Ω resistance is removed, the balance point shifts to 40 cm. The value of R_1 is (in ohms) :-

(1) 20 (2) 10 (3) 60 (4) 40

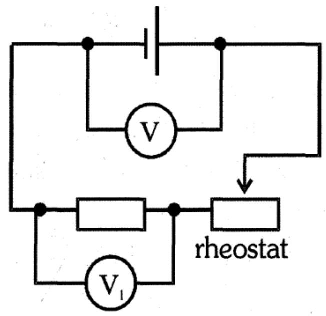
105. A 1 Ω voltmeter has a range of 1 V. Find the additional resistance which has to be joined with the series in voltmeter to increase the range of voltmeter to 100 V :

(1) 10 Ω (2) $\frac{1}{99}$ Ω (3) 99 Ω (4) 100 Ω

106. A galvanometer having a resistance G and current i_a flowing in it, produces full scale deflection. If S_1 is the value of shunt which, converts it into an ammeter of range 0 - i and S_2 is the value of the s shunt for the range 0 - 2i. Then the ratio $\frac{S_1}{S_2}$ will be :-

(1) 1 (2) 2 (3) $\frac{1}{2}\left(\frac{i-i_a}{2i-i_a}\right)$ (4) $\left(\frac{2i-i_a}{i-i_a}\right)$

107. If the rheostat slider were to move from the extreme right to the far left, How will the reading of voltmeter V_1 change?

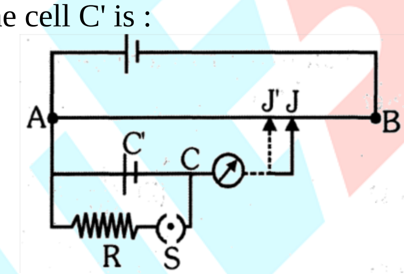


(1) First increase and then decrease
(2) First decrease and then increase
(3) Increase continuously
(4) Decrease continuously

POTENTIOMETER

108. It is observed in a potentiometer experiment that no current passes through the galvanometer, when the terminals of a cell are connected across a certain length of the potentiometer wire. On shunting the cell by a 2 Ω resistance, the balancing length is reduced to half. The internal resistance of the cell is :
(1) 4 Ω (2) 2 Ω (3) 9 Ω (4) 18 Ω

109. In the potentiometer circuit shown in the figure, the balancing length AJ = 60 cm when switch Sis open. When switch S is closed and the value of R =50, the balancing length AJ = 50 cm. The internal resistance of the cell C' is :



(1) 1.2 Ω (2) 1.0 Ω (3) 0.8 Ω (4) 0.6 Ω

110. In a potentiometer experiment when terminals of the cell are connected at distance of 52 cm on the wire, then no current flows through it. When 5 Ω shunt resistance is connected across the cell the balancing length is 40 cm. The internal resistance of the cell (in Ω) is :
(1) 5 (2) $\frac{200}{52}$ (3) $\frac{52}{8}$ (4) 1·5

111. A potentiometer wire has a resistance 40 Ω and its length is 10 m. It is connected to a resistance of 760 Ω in series. If emf of battery is 2 V then potential gradient is :
(1) 0.5×10^{-6} V/m (2) 1×10^{-6} V/m (3) 1×10^{-2} V/m (4) 2×10^{-6} V/m

112. A 6 volts battery is connected to the terminals of a three meters long wire of uniform thickness and 100 ohm resistance. The potential difference between two points on the wire separated by a distance of 50 cm will be :
(1) 3 volts (2) 1 volts (3) 1.5 volts (4) 2 volts

113. Potentiometer is used for measuring :
(1) potential difference
(2) current

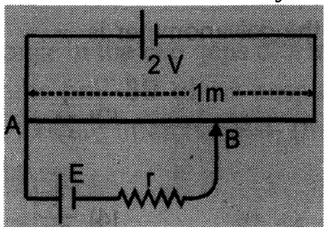
(3) internal resistance (4) All of these

114. Length of a potentiometer wire is kept long and uniform to achieve :-

(1) uniform and more potential gradient (2) non-uniform and more potential gradient

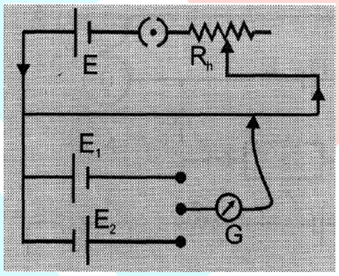
(3) uniform and less potential gradient (4) non-uniform and less potential gradient

115. In figure battery E is balanced over a 55 cm length of potentiometer wire but when a resistance of 10 Ω is connected in parallel with the battery then it balances over a 50 cm length of the potentiometer wire then internal resistance r of the battery is :



(1) 1 Ω (2) 3 Ω (3) 10 Ω (4) 5 Ω

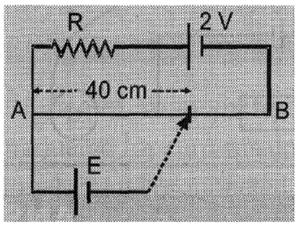
116. The following diagram shown the circuit for the comparison of e.m.f. of two cells. The circuit can be corrected by :-



(1) Reversing the terminals of E (2) Reversing the terminals of E_1

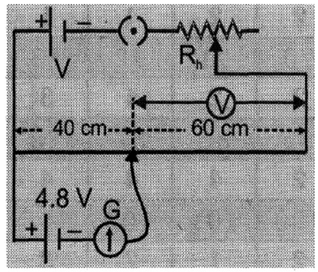
(3) Reversing the terminals of E_2 (4) Reversing the current in R_h

117. AB is a potentiometer wire of length 100 cm and resistance 10 ohms. It is connected in series with a resistance R = 40 ohms and a battery of e.m.f. 2 V and negligible internal resistance. If a source of unknown e.m.f. E is balanced by 40 cm length of the potentiometer wire, the value of E is :



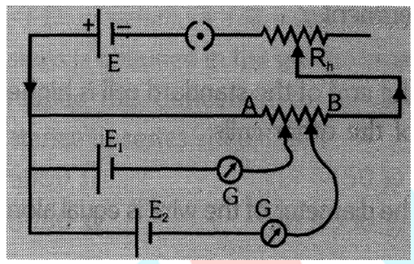
(1) 0.8 V (2) 1.6 V (3) 0.08 V (4) 0.16 V

l18. In the following circuit, the reading of the voltmeter will be :- (in volts)



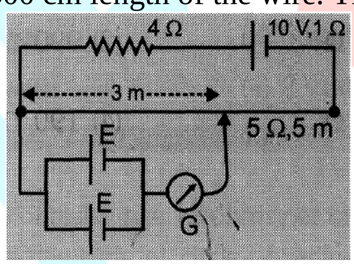
(1) 7.2 (2) 4.8 (3) 6 (4) 4

119. In the following diagram, the deflection in the galvanometer in a potentiometer circuit is zero, then :-



(1) $E_1 > E_2$ (2) $E_2 > E_1$ (3) $E_1 = E_2$ (4) $E_1 + E_2 = E$

120. A resistance of 4 Ω and a wire of length 5 m and resistance 5 n are joined in 'series and connected to a cell of e.m.f. 10 V and internal resistance 1 Ω. A Parallel combination of two identical cells is balanced across 300 cm length of the wire. The e.m.f. E of each cell is:



(1) 1.5 V (2) 3.0 V (3) 0.67 V (4) 1.33 V

121. The emf of a standard cell balanced over a 150 cm length of a potentiometer wire. When this cell is shunted by a 2 Ω resistance, the null point is obtained at 100 cm. The value of internal resistance of the cell is :-
(1) 0.1 ohms (2) 1 ohms (3) 2 ohms (4) 0.5 ohms

122. The sensitivity o¥ a potentiometer is increased by
(1) increasing the emf of the cell
(2) increasing the length of the potentiometer wire
(3) decreasing the length of the potentiometer wire
(4) none of the above

123. A potential gradient is established in the wire by a standard cell for the comparison of emf's of two cells in a potentiometer experiment. Which possibility of the following will lead to the failure of the experiment ?
(1) the emf of the standard cell is higher than that of the other cells.
(2) the diameter of the wire is equal along its length

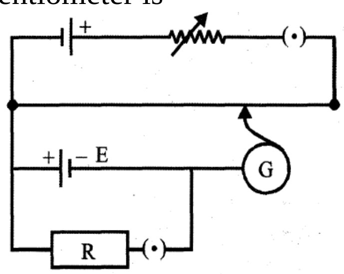
(3) the number of wires is ten.

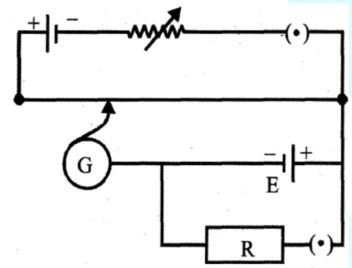
(4) the emf of the standard cell is less than that of either cells

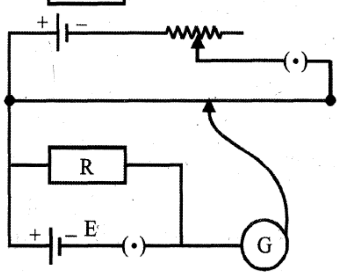
124. Potentiometer wire length is 10 m, having a total resistance of to n. If a battery of emf 2 volts (of negligible internal resistance) and a rheostat are connected to it then the potential gradient is 20 mV/m; find the resistance imparted through the rheostat :

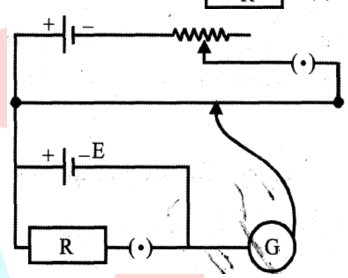
(1) 90 Ω (2) 990 Ω (3) 40 Ω (4) 190 Ω

125. The correct circuit for the determination of internal resistance of a battery by using potentiometer is

(1)


(2)


(3)


(4)


ANSWER KEY

EXERCISE-I (Conceptual Question)

1.	(2)	**2.**	(2)	**3.**	(2)	**4.**	(3)	**5.**	(2)	**6.**	(2)	**7.**	(3)
8.	(4)	**9.**	(2)	**10.**	(2)	**11.**	(3)	**12.**	(4)	**13.**	(3)	**14.**	(3)
15.	(3)	**16.**	(2)	**17.**	(1)	**18.**	(4)	**19.**	(4)	**20.**	(3)	**21.**	(1)
22.	(3)	**23.**	(4)	**24.**	(1)	**25.**	(2)	**26.**	(4)	**27.**	(4)	**28.**	(3)
29.	(1)	**30.**	(4)	**31.**	(3)	**32.**	(3)	**33.**	(3)	**34.**	(3)	**35.**	(1)
36.	(2)	**37.**	(4)	**38.**	(3)	**39.**	(4)	**40.**	(3)	**41.**	(1)	**42.**	(1)
43.	(4)	**44.**	(3)	**45.**	(1)	**46.**	(1)	**47.**	(1)	**48.**	(4)	**49.**	(1)
50.	(1)	**51.**	(4)	**52.**	(2)	**53.**	(1)	**54.**	(3)	**55.**	(2)	**56.**	(2)
57.	(4)	**58.**	(1)	**59.**	(2)	**60.**	(2)	**61.**	(3)	**62.**	(2)	**63.**	(3)
64.	(3)	**65.**	(1)	**66.**	(4)	**67.**	(1)	**68.**	(2)	**69.**	(4)	**70.**	(2)
71.	(2)	**72.**	(4)	**73.**	(3)	**74.**	(2)	**75.**	(2)	**76.**	(3)	**77.**	(2)
78.	(1)	**79.**	(4)	**80.**	(1)	**81.**	(1)	**82.**	(1)	**83.**	(1)	**84.**	(3)
85.	(2)	**86.**	(4)	**87.**	(4)	**88.**	(4)	**89.**	(3)	**90.**	(2)	**91.**	(3)
92.	(1)	**93.**	(1)	**94.**	(4)	**95.**	(1)	**96.**	(1)	**97.**	(2)	**98.**	(1)
99.	(3)	**100.**	(2)	**101.**	(1)	**102.**	(2)	**103.**	(3)	**104.**	(1)	**105.**	(3)
106.	(4)	**107.**	(3)	**108.**	(2)	**109.**	(2)	**110.**	(4)	**111.**	(3)	**112.**	(2)
113.	(4)	**114.**	(3)	**115.**	(1)	**116.**	(3)	**117.**	(4)	**118.**	(1)	**119.**	(2)
120.	(2)	**121.**	(2)	**122.**	(2)	**123.**	(4)	**124.**	(1)	**125.**	(4)		