Exercise - I (Objective Problems)

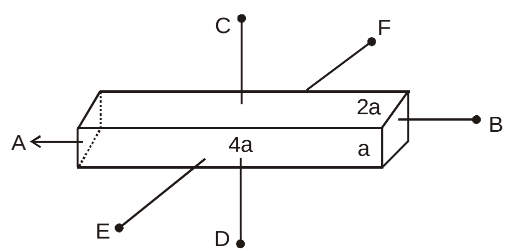
1. A wire of cross-section area A, length L_1, resistivity ρ_1 and temperature coefficient of resistivity α_1 is connected to a second wire of length L_2, resistivity ρ_2, temperature coefficient of resistivity α_2 and the same area A, so that wire carries same current. Total resistance R is independent of temperature for small temperature change if (Thermal expansion effect is negligible)

(A) $\alpha_1 = -\alpha_2$ (B) $\rho_1 L_1 \alpha_1 + \rho_2 L_2 \alpha_2 = 0$
(C) $L_1\alpha_1 + L_2\alpha_2 = 0$ (D) None

2. In order to increase the resistance of a given wire of uniform cross section to four times its value, a fraction of its length is stretched uniformly till the full length of the wire becomes $\frac{3}{2}$ times the original length what is the value of this fraction ?

(A) $\frac{1}{4}$ (B) $\frac{1}{8}$
(C) $\frac{1}{16}$ (D) $\frac{1}{6}$

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



(A) x = y = z (B) x > y > z
(C) y > z > x (D) x > z > y

4. A brass disc and a carbon disc of same radius are assembled alternatively to make a cylindrical conductor. The resistance of the cylinder is independent of the temperature. The ratio of thickness of the brass disc to that of the carbon disc is [α is temperature coefficient of resistance & Neglect linear expansion]

(A) $\left|\frac{\alpha_C \rho_C}{\alpha_B \rho_B}\right|$ (B) $\left|\frac{\alpha_C \rho_B}{\alpha_B \rho_C}\right|$

(C) $\left|\frac{\alpha_B \rho_C}{\alpha_C \rho_B}\right|$ (D) $\left|\frac{\alpha_B \rho_B}{\alpha_C \rho_C}\right|$

5. A current of (2.5 ± 0.05) A flows through a wire and develops a potential difference of (10 ± 0.1) volt. Resistance of the wire in ohm, is

(A) 4 ± 0.12 (B) 4 ± 0.04
(C) 4 ± 0.08 (D) 4 ± 0.02

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

(A) 1 : 2 (B) 2 : 1
(C) 4 : 1 (D) 1 : 4

7. In a wire of cross-section radius r, free electrons travel with drift velocity v when a current I flows through the wire. What is the current in another wire of half the radius and of the same material when the drift velocity is 2v ?

(A) 2I (B) I
(C) I/2 (D) I/4

8. Read the following statements carefully :

Y : The resistivity of a semiconductor decreases with increases of temperature.

Z : In a conducting solid, the rate of collision between free electrons and ions increases with increase of temperature.

Select the correct statement from the following

(A) Y is true but Z is false
(B) Y is false but Z is true
(C) Both Y and Z are true
(D) Y is true and Z is the correct reason for Y

9. A piece of copper and another of germanium are cooled from room temperature to 80K. The resistance of

(A) each of them increases
(B) each of them decreases
(C) copper increases and germanium decreases
(D) copper decreases and germanium increases

10. An insulating pipe of cross-section area 'A' contains an electrolyte which has two types of ions → their charges being –e and +2e. A potential difference applied between the ends of the pipe result in the drifting of the two types of ions, having drift speed = v (–ve ion) and v/4 (+ ve ion). Both ions have the same number per unit volume = n. The current flowing through the pipe is

(A) nev A/2 (B) nev A/4
(C) 5nev A/2 (D) 3nev A/2

11. Current density in a cylindrical wire of radius R is given as $J = \begin{cases} J_0\left(\frac{x}{R} - 1\right) & \text{for } 0 \le x < \frac{R}{2} \\ J_0 \frac{x}{R} & \text{for } \frac{R}{2} \le x \le R \end{cases}$. The current flowing in the wire is

(A) $\frac{7}{24}\pi J_0 R^2$ (B) $\frac{1}{6}\pi J_0 R^2$

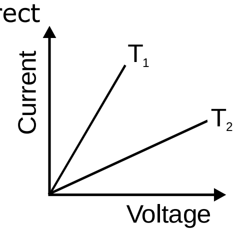
(C) $\frac{7}{12}\pi J_0 R^2$ (D) $\frac{5}{12}\pi J_0 R^2$

12. A current I flows through a uniform wire of diameter d when the mean electron drift velocity is V. the same current will flow through a wire of diameter d/2 made of the same material if the mean drift velocity of the electron is

(A) v/4 (B) v/2

(C) 2v (D) 4v

13. The current in a metallic conductor is plotted against voltage at two different temperatures T_1 and T_2. Which is correct



(A) $T_1 > T_2$ (B) $T_1 < T_2$

(C) $T_1 = T_2$ (D) none

14. A uniform copper wire carries a current i amperes and has p carriers per metre³. The length of the wire is ℓ metres and its cross-section area is s metre². If the charge on a carrier is q coulombs, the drift velocity in ms^{-1} is given by

(A) $i/\ell sq$ (B) i/psq

(C) psq/i (D) $i/ps\ell q$

15. In the presence of an applied electric field $(\vec{E})$ in a metallic conductor.

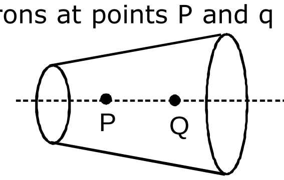
(A) The electrons move in the direction of $\vec{E}$

(B) The electrons move in a direction opposite to $\vec{E}$

(C) The electrons may move in any direction randomly, but slowly drift in the direction of $\vec{E}$

(D) The electrons move randomly but slowly drift in a direction opposite to $\vec{E}$

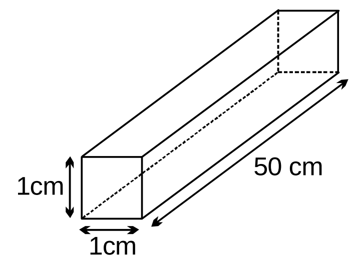
16. A wire has a non-uniform cross-section as shown in figure. A steady current flows through it. The drift speed of electrons at points P and q is v_p and v_Q.



(A) $v_p = v_Q$ (B) $v_p < v_Q$

(C) $v_p > v_Q$ (D) Data insufficient

17. A rectangular carbon block has dimensions 1.0 cm × 1.0 cm × 50 cm. Resistances are measured, first across two square ends and then across two rectangular ends, respectively. If resistivity of carbon is 3.5×10^{-5} Ω-m, then values of measured resistances respectively are :



(A) $\frac{35}{2}\times10^{-2}\,\Omega,\ 7\times10^{-5}\,\Omega$

(B) $7\times10^{-5}\,\Omega,\ \frac{15}{2}\times10^{-2}\,\Omega$

(C) $\frac{35}{2}\times10^{-4}\,\Omega,\ 7\times10^{-7}\,\Omega$

(D) $\frac{15}{2}\Omega,\ 7\times10^{-2}\Omega$

18. A storage battery is connected to a charger for charging with a voltage of 12.5 Volts. The internal resistance of the storage battery is 1 Ω. When the charging current is 0.5 A, the emf of the storage battery is :

(A) 13 Volts (B) 12.5 Volts

(C) 12 Volts (D) 11.5 Volts

19. The terminal voltage across a battery of emf E can be

(A) 0 (B) > E

(C) < E (D) all of above

20. In order to determine the e.m.f of a storage battery it was connected in series with a standard cell in a certain circuit and a current I_1 was obtained. When the battery is connected to the same circuit opposite to the standard cell a current I_2 flow in the external circuit from the positive pole of the storage battery was obtained. What is the e.m.f ε_1 of the storage battery? The e.m.f of the standard cell is ε_2.

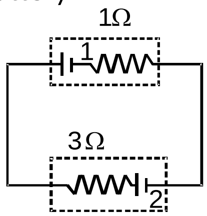
(A) $\varepsilon_1 = \frac{I_1 + I_2}{I_1 - I_2}\varepsilon_2$ (B) $\varepsilon_1 = \frac{I_1 + I_2}{I_2 - I_1}\varepsilon_2$

(C) $\varepsilon_1 = \frac{I_1 - I_2}{I_1 + I_2}\varepsilon_2$ (D) $\varepsilon_1 = \frac{I_2 - I_1}{I_1 + I_2}\varepsilon_2$

21. One end of a Nichrome wire of length 2L and cross-sectional area A is attatched to an end of another Nichrome wire of length L and cross-sectional area 2A. If the free end of the longer wire is at an

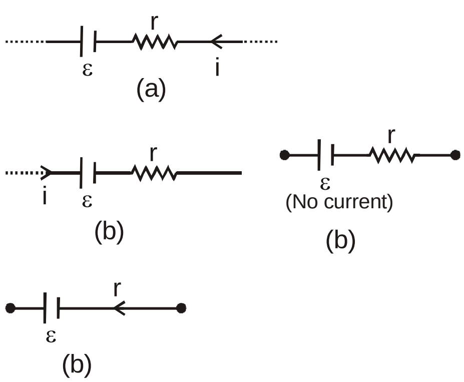
electric potential of 8.0 volts, and the free end of the shorter wire is at an electric potential of 1.0 volt, the potential at the junction of the two wires is equal to
(A) 2.4 V (B) 3.2 V
(C) 4.5 V (D) 5.6 V

22. In the figure shown, battery 1 has emf = 6V and internal resistance = 1Ω. Battery 2 has emf = 2V and internal resistance = 3Ω. The wires have negligible resistance. What is the potential difference across the terminals of battery 2?



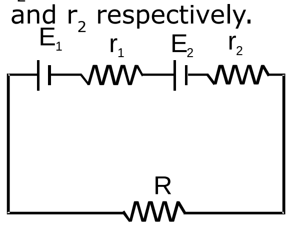
(A) 4V (B) 1.5V
(C) 5 V (D) 0.5V

23.



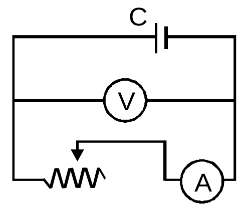
In which of the above cells, the potential difference between the terminals of a cell exceeds its emf.
(A) a (B) b
(C) c (D) d

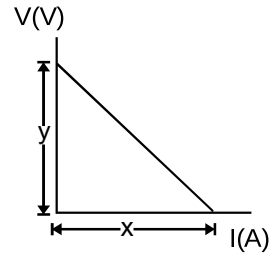
24. Under what condition current passing through the resistance R can be increased by short circuiting the battery of emf E_2. The internal resistances of the two batteries are r_1 and r_2 respectively.



(A) $E_2r_1 > E_1(R + r_2)$ (B) $E_1r_2 > E_2(R + r_1)$
(C) $E_2r_2 > E_1(R + r_2)$ (D) $E_1r_1 > E_2(R + r_1)$

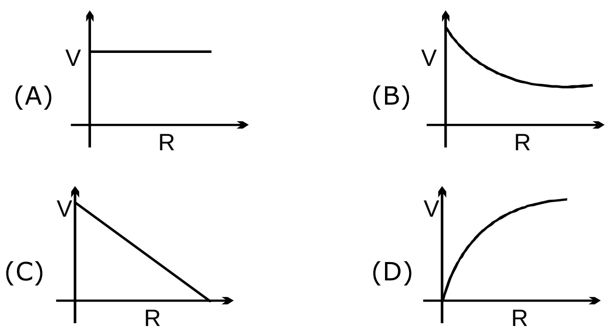
25. The diagram besides shows a circuit used in an experiment to determine the emf and internal resistance of the cell C. A graph was plotted of the potential difference V between the terminals of the cell against the current I, which was varied by adjusting the rheostat. The graph is shown on the right; x and y are the intercepts of the graph with the axes as shown. What is the internal resistance of the cell ?



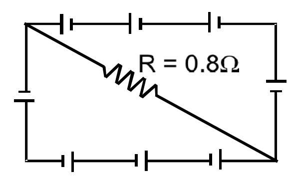


(A) x (B) y
(C) x/y (D) y/x

26. A cell of emf E has an internal resistance r & is connected to rheostat. When resistance R of rheostat is changed correct graph of potential difference across it is

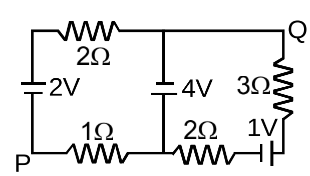


27. A circuit is comprised of eight identical batteries and a resistor R = 0.8Ω. Each battery has an emf of 1.0 V and internal resistance of 0.2Ω. The voltage difference across any of the battery is



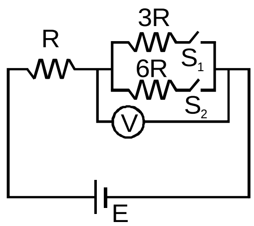
(A) 0.5 V (B) 1.0 V
(C) 0 V (D) 2 V

28. In the circuit shown, what is the potential difference V_{PQ} ?



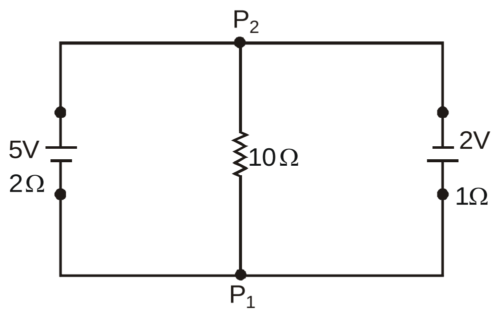
(A) + 3V (B) + 2V
(C) – 2V (D) none

29. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed. The reading of voltmeter is V_3 when both S_1 and S_2 are closed then



(A) $V_2 > V_1 > V_3$ (B) $V_3 > V_2 > V_1$
(C) $V_3 > V_1 > V_2$ (D) $V_1 > V_2 > V_3$

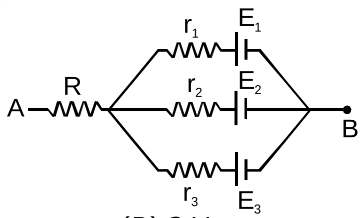
30. A 5 V battery with internal resistance 2 Ω and a 2V battery with internal resistance 1 Ω are connected to a 10 Ω resistor as shown in the figure.



The current in the 10 Ω resistor is :
(A) 0.03 A P_1 to P_2 (B) 0.03 A P_2 to P_1
(C) 0.27 A P_1 to P_2 (D) 0.27 A P_2 to P_1

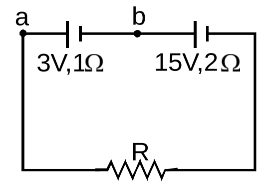
31. The Kirchhoff's first law $(\Sigma i = 0)$ and second law $(\Sigma iR = 0 = \Sigma E)$, where the symbols have their usual meanings, are respectively based on
(A) conservation of charge, conservation of energy
(B) conservation of charge, conservation of momentum
(C) conservation of energy, conservation of charge
(D) conservation of momentum, conservation of charge

32. In the network shown the potential difference between A and B is ($R = r_1 = r_2 = r_3 = 1\ \Omega$, $E_1 = 3$ V, $E_2 = 2$ V, $E_3 = 1$ V)



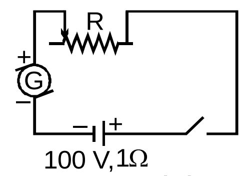
(A) 1 V (B) 2 V
(C) 3 V (D) 4 V

33. Two batteries one of the emf 3V, internal resistance 1 ohm and the other of emf 15 V, internal resistance 2 ohm are connected in series with a resistance R as shown. If the potential difference between a and b is zero the resistance of R in ohm is



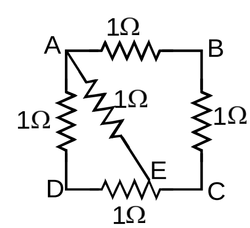
(A) 5 (B) 7
(C) 3 (D) 1

34. The battery in the diagram is to be charged by the generator G. The generator has a terminal voltage of 120 volts when the charging current is 10 amperes. The battery has an emf of 100 volts and an internal resistance of 1 ohm. In order to charge the battery at 10 amperes charging current, the resistance R should be set at



(A) 0.1Ω (B) 0.5 Ω
(C) 1.0 Ω (D) 5.0 Ω

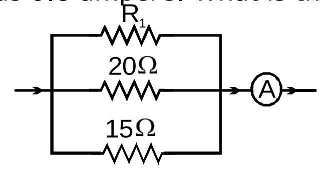
35. ABCD is a square where each side is a uniform wire of resistance 1Ω. A point E lies on CD such that if a uniform wire of resistance 1Ω is connected across AE and constant potential difference is applied across A and C then B and E are equipotential.



(A) $\frac{CE}{ED} = 1$ (B) $\frac{CE}{ED} = 2$

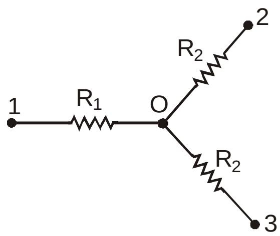
(C) $\frac{CE}{ED} = \frac{1}{\sqrt{2}}$ (D) $\frac{CE}{ED} = \sqrt{2}$

36. In the given circuit the current flowing through the resistance 20 ohms is 0.3 ampere while the ammeter reads 0.8 ampere. What is the value of R_1 ?



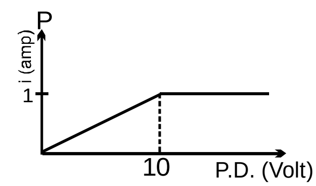
(A) 30 ohms (B) 40 ohms
(C) 50 ohms (D) 60 ohms

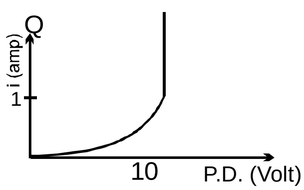
37. Find the current flowing through the resistance R_1 of the circuit shown in figure if the resistance are equal to $R_1 = 10\ \Omega$, $R_2 = 20\ \Omega$, and $R_3 = 30\ \Omega$, and the potential of points 1, 2 and 3 are equal to $\varphi_1 = 10V$, $\varphi_2 = 6V$ and $\varphi_3 = 5V$.



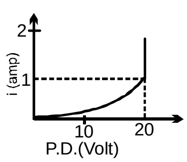
(A) 0.1 A
(B) 0.2 A
(C) 0.3 A
(D) 0.4 A

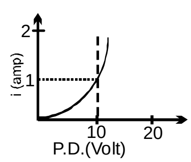
38. Two current elements P and Q have current voltage characteristics as shown below :

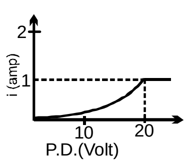


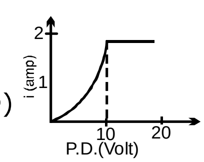


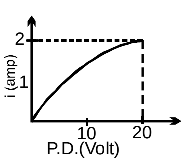
Which of the graphs given below represents current voltage characteristics when P and Q are in series.

(A)


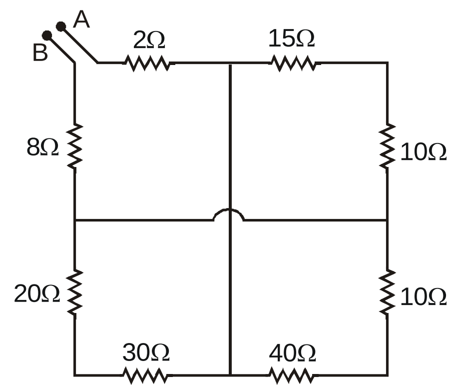
(B)


(C)


(D)


(E)


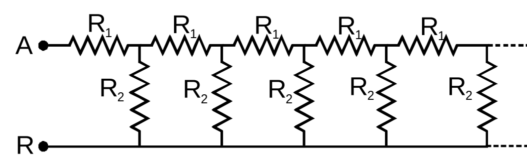
39. The equivalent resistance between points A and B is :



(A) $\frac{65}{2}\Omega$
(B) $\frac{45}{2}\Omega$
(C) $\frac{5}{2}\Omega$
(D) $\frac{91}{2}\Omega$

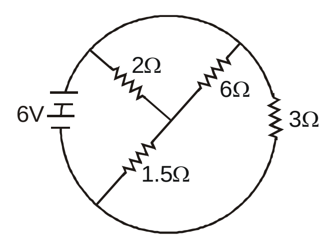
40. The resistance of the series combination of two resistances is S. Whey they are joined in a parallel, the total resistance is P. If S = nP, then the minimum possible value of n is :
(A) 4
(B) 3
(C) 2
(D) 1

41. Consider an infinte ladder network shown in figure. A voltage V is applied between the points A and B. This applied value of voltage is halved after each section.



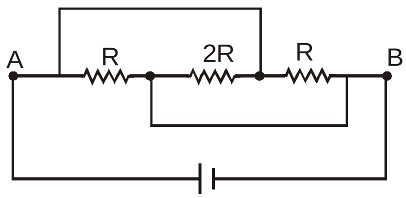
(A) $R_1/R_2 = 1$
(B) $R_1/R_2 = 1/2$
(C) $R_1/R_2 = 2$
(D) $R_1/R_2 = 3$

42. The total current supplied to the circuit by the battery is :



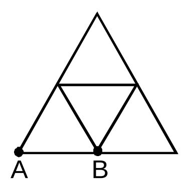
(A) 1 A
(B) 2 A
(C) 4 A
(D) 6 A

43. In the figure shown the current flowing through 2 R is :



(A) from left to right (B) from right to left
(C) no current (D) None of these

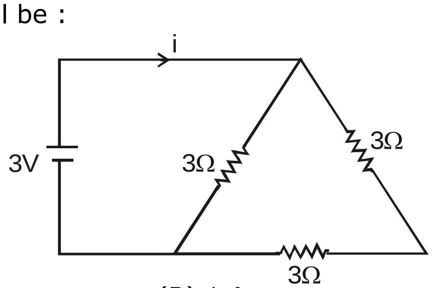
44. In the diagram resistance between any two junctions is R. Equivalent resistance across terminals A and B is



(A) $\frac{11R}{7}$ (B) $\frac{18R}{11}$
(C) $\frac{7R}{11}$ (D) $\frac{11R}{18}$

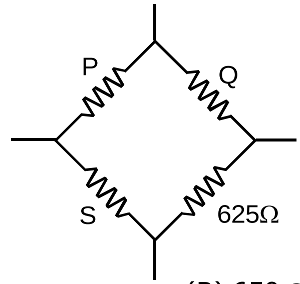
45. In a balanced wheat stone bridge, current in the galvanometer is zero. It remains zero when
(1) battery emf is increased
(2) all resistances are increased by 10 ohms
(3) all resistances are made five times
(4) the battery and the galvanometer are interchanged
(A) only (1) is correct
(B) (1), (2) and (3) are correct
(C) (1), (3) and (4) are correct
(D) (1) and (3) are correct

46. A 3 volt battery with negligibel internal resistance is connected in a circuit as shown in the figure. Current i will be :



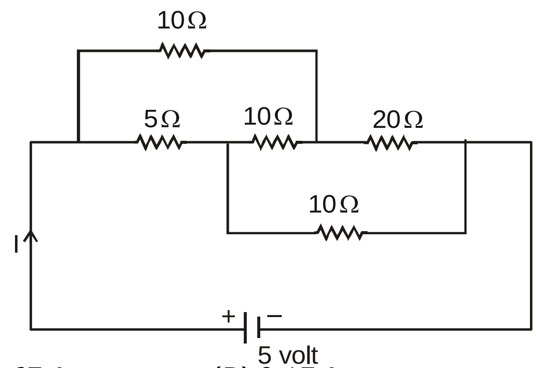
(A) 1/3 A (B) 1 A
(C) 1.5 A (D) 2 A

47. A Wheatstone's bridge is balanced with a resistance of 625 Ω in the third arm, where P, Q and S are in the 1st, 2nd and 4th arm respectively. If P and Q are interchanged, the resistance in the third arm has to be increased by 51Ω to secure balance. The unknown resistance in the fourth arm is



(A) 625 Ω (B) 650 Ω
(C) 676 Ω (D) 600 Ω

48. The current I drawn from the 5 volt source will be :



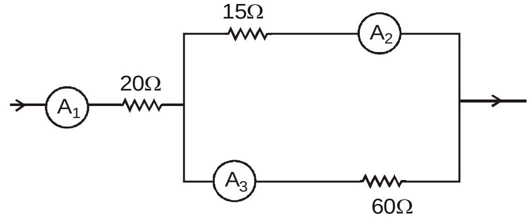
(A) 0.67 A (B) 0.17 A
(C) 0.33 A (D) 0.5 A

49. In a Wheat stone's bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is foremd by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be

(A) $\frac{P}{Q} = \frac{R(S_1 + S_2)}{2S_1S_2}$ (B) $\frac{P}{Q} = \frac{R}{S_1 + S_2}$

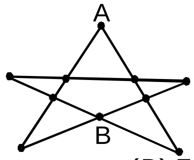
(C) $\frac{P}{Q} = \frac{2R}{S_1 + S_2}$ (D) $\frac{P}{Q} = \frac{R(S_1 + S_2)}{S_1S_2}$

50. If the reading of ammeter A_3 in figure is 0.75 A. Neglecting the resistance of the ammeters, the reading of ammeter A_2 will be :



(A) 1.5 A (B) 3 A
(C) 4.5 A (D) 6 A

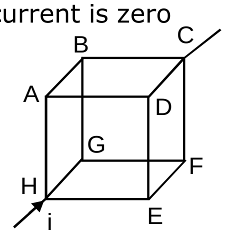
51. The resistance of all the wires between any two adjacent dots is R. Then equivalent resistance between A and B as shown in figure is :



(A) 7/3 R (B) 7/6 R
(C) 14/8 R (D) None of these

52. In the box shown current i enters at H and leaves at C.

If $i_{AB} = \frac{i}{6}, i_{DC} = \frac{2i}{3}, i_{HA} = \frac{i}{2}, i_{GF} = \frac{i}{6}, i_{HE} = \frac{i}{6}$, choose the branch in which current is zero



(A) BG (B) FC (C) ED (D) none

53 A resistor of resistance R is connected to a cell of internal resistane 5 Ω. The value of R is varied from 1 Ω to 5 Ω. The power consumed by R :
(A) increases continuously
(B) decreases continuously
(C) first decreases then increases
(D) first increases then decreases.

54. Power generated across a uniform wire connected across a supply is H. If the wire is cut into n equal parts and all the parts are connected in parallel across the same supply, the total power generated in the wire is

(A) $\frac{H}{n^2}$ (B) n^2H

(C) nH (D) $\frac{H}{n}$

55. A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled if
(A) both the length and the radius of the wire are halved
(B) both the length and the radius of the wire are doubled
(C) the radius of the wire is doubled
(D) the length of the wire is doubled

56. When electric bulbs of same power, but different marked voltage are connected in series across the power line, their brightness will be
(A) proportional to their marked voltage
(B) inversely proportional to their marked voltage
(C) proportional to the square of their marked voltage
(D) inversely proportional to the square of their marked voltage
(E) the same for all of them

57. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is :
(A) 1 (B) 4 (C) 2 (D) 3

58. Two bulbs rated (25 W – 220 V) and (100 W – 220 V) are connected in series to a 440 V line. Which one is likely to fuse ?
(A) 25 W bulb (B) 100 W bulb
(C) both bulbs (D) none

59. Rate of dissipation of Joule's heat in resistance per unit volume is (symbols have usual meaning)
(A) σE (B) σJ (C) JE (D) None

60. The charge flowing through a resistance R varies with time as $Q = 2t - 8t^2$. The total heat produced in the resistance is (for $0 \le t \le \frac{1}{8}$)

(A) $\frac{R}{6}$ joules (B) $\frac{R}{3}$ joules

(C) $\frac{R}{2}$ joules (D) R joules

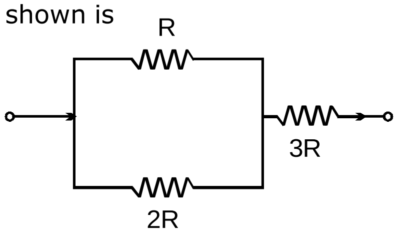
61. If the length of the filament of a heater is reduced by 10%, the power of the heater will
(A) increase by about 9%
(B) increase by about 11%
(C) increase by about 19%
(D) decrease by about 10%

62. A heater A gives out 300 W of heat when connected to a 200 V d.c. supply. A second heater B gives out 600 W when connected to a 200 v d.c. supply. If a series combination of the two heaters is connected to a 200 V d.c. supply the heat output will be
(A) 100 W (B) 450 W
(C) 300 W (D) 200 W

63. Two bulbs one of 200 volts, 60 watts & the other of 200 volts, 100 watts are connected in series to a 200 volt supply. The power consumed will be
(A) 37.5 watt (B) 160 watt
(C) 62.5 watt (D) 110 watt

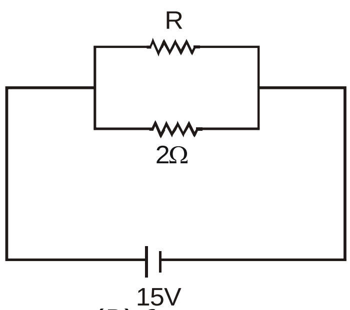
64. Three 60 W light bulbs are mistakenly wired in series and connected to a 120 V power supply. Assume the light bulbs are rated for single connection to 120 V. With the mistaken connection, the power dissipated by each bulb is
(A) 6.7 W (B) 13.3 W
(C) 20 W (D) 40 W

65. The ratio of powers dissipatted respectively in R and 3R, as shown is



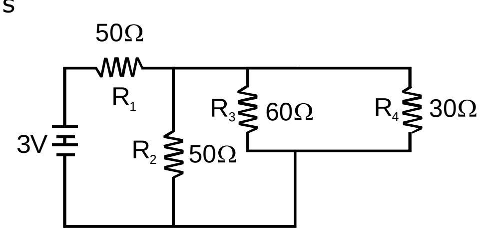
(A) 9
(B) 27/4
(C) 4/9
(D) 4/27

66. If in the circuit, power dissipation is 150 W then R is



(A) 2 Ω
(B) 6 Ω
(C) 5 Ω
(D) 4 Ω

67. In the circuit shown, the resistances are given in ohms and the battery is assumed ideal with emf equal to 3.0 volts The resistor that dissipates the most power is



(A) R_1
(B) R_2
(C) R_3
(D) R_4

68. What amount of heat will be generated in a coil of resistance R due to a charge q passing through it if the current in the coil decreases to zero uniformly during a time interval Δt

(A) $\frac{4}{3}\frac{q^2R}{\Delta t}$
(B) $ln\frac{q^2R}{2\Delta t}$
(C) $\frac{2q^2R}{3\Delta t}$
(D) $ln\frac{(2\Delta t)}{q^2R}$

69. The variation of current (I) and voltage (V) is as shown in figure A. The variation of power P with current I is best shown by which of the following graph

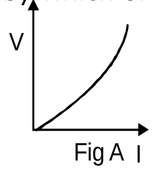
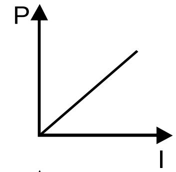
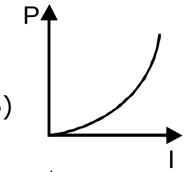
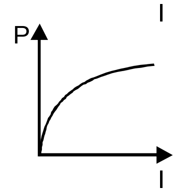
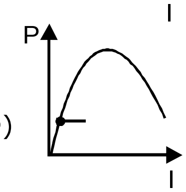


Fig A

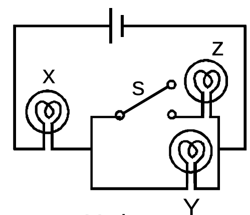
(A)


(B)


(C)


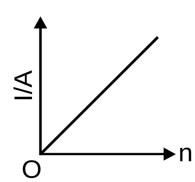
(D)


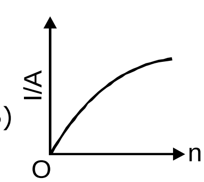
70. If X, Y and Z in figure are identical lamps, which of the following changes to the brightnesses of the lamps occur when switch S is closed ?

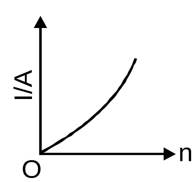


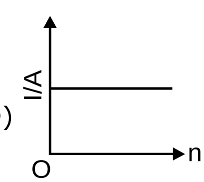
(A) X stays the same, Y decreases
(B) X increases, Y decreases
(C) X increases, Y stays the same
(D) X decreases, Y increases

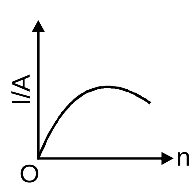
71. A battery consists of a variable number n of identical cells having internal resistance connected in series. The terminals of the battery are short circuited and the current I measured.
Which one of the graph below shows the relationship between I and n ?

(A)


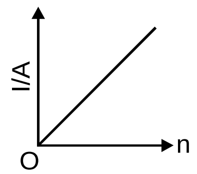
(B)


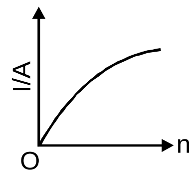
(C)


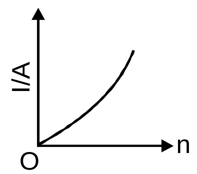
(D)


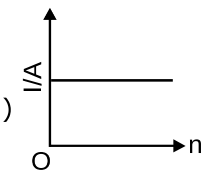
(E)


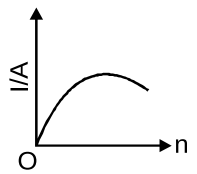
72. In previous problem, if the cell had been connected in parallel (instead of in series) which of the above graphs would have shown the relationship between total current I and n ?

(A) 

(B) 

(C) 

(D) 

(E) 

73. n identical cells are joined in series with its two cells A and B in the loop with reversed polarities. EMF of each shell is E and internal resistance r. Potential difference across cell A or B is (here n > 4)

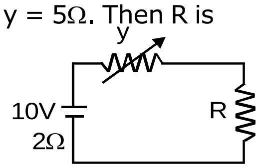
(A) $\frac{2E}{n}$ (B) $2E\left(1-\frac{1}{n}\right)$

(C) $\frac{4E}{n}$ (D) $2E\left(1-\frac{2}{n}\right)$

74. A wire of length L and 3 identical cells of negligible internal resistances are connected is series. Due to the current, the temperature of the wire is raised by ΔT in time t. N number of similar cells is now connected in series with a wire of the same material and cross section but of length 2L. The temperature of the wire is raised by the same amount ΔT in the same time t. The value of N is :

(A) 4 (B) 6 (C) 8 (D) 9

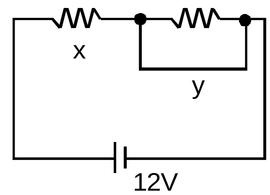
75. In the figure shown the power generated in y is maximum when y = 5Ω. Then R is



(A) 2 Ω (B) 6 Ω
(C) 5 Ω (D) 3 Ω

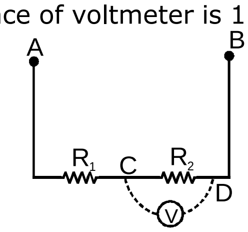
76. If an ammeter is to be used in place of a voltmeter then we must connect with the ammeter a
(A) Low resistance in parallel
(B) High resistance in parallel
(C) High resistance in series
(D) Low resistance in series

77. When an ammeter of negligible internal resistan ce is inserted in series with circuit it reads 1A. When the voltmeter of very large resistance is connected across X it reads 1V. When the point A and B are shorted by a conducting wire, the voltmeter measures 10 V across the battery. The internal resistance of the battery is equal to



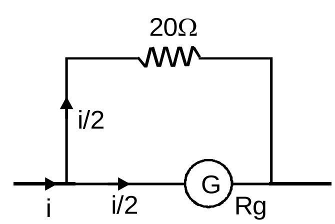
(A) zero (B) 0.5 Ω
(C) 0.2 Ω (D) 0.1 Ω

78. Resistances R_1 and R_2 each 60Ω are connected in series as shown in figure. The Potential difference between A and B is kept 120 volt. Then what will be the reading of voltmeter connected between the point C & D if resistance of voltmeter is 120Ω.



(A) 48 V (B) 24 V
(C) 40 V (D) None

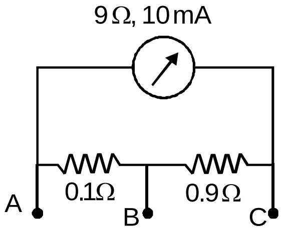
79. In a galvanometer, the deflection becomes one half when the galvanometer is shunted by a 20Ω resistor. The galvanometer resistance is



(A) 5Ω (B) 10Ω
(C) 40Ω (D) 20Ω

80. A galvanometer has a resistance of 20Ω and reads full-scale when 0.2 V is applied across it. To convert it into a 10 A ammeter, the galvanometer coil should have a
(A) 0.01 Ω resistor connected across it
(B) 0.02 Ω resistor connected across it
(C) 200 Ω resistor connected in series with it
(D) 2000 Ω resistor connected in series with it

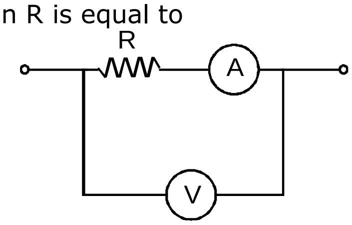
81. A milliammeter of range 10mA and resistance 9Ω is joined in a circuit as shown. The metre gives full-scale deflection for current I when A and B are used as its terminals, i.e., current enters at A and leaves at B (C is left isolated). The value of I is



(A) 100 mA (B) 900 mA
(C) 1 A (D) 1.1 A

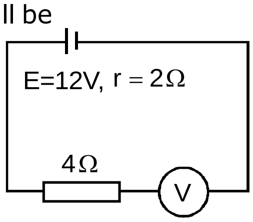
82. A galvanometer coil has a resistance 90Ω and full scale deflection current 10 mA. A 910 Ω resistance is connected in series with the galvanometer to make a voltmeter. If the least count of the voltmeter is 0.1 V, the number of divisions on its scale is
(A) 90 (B) 91
(C) 100 (D) none

83. In the circuit shown the resistance of voltmeter is 10,000 ohm and that of ammeter is 20 ohm. The ammeter reading is 0.10 Amp and voltmeter reading is 12 volt. Then R is equal to



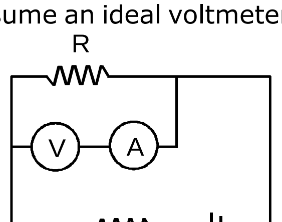
(A) 122 Ω (B) 140 Ω (C) 116 Ω (D) 100 Ω

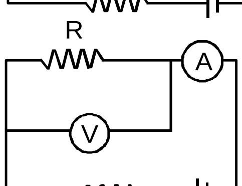
84. By error, a student places moving-coil voltmeter V (nearly ideal) in series with the resistance in a circuit in order to read the current, as shown. The voltmeter reading will be

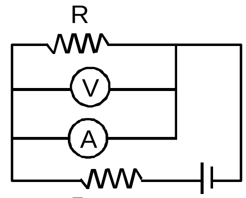


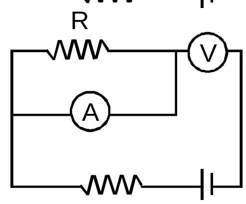
(A) 0 (B) 4V (C) 6V (D) 12V

85. Which of the following wiring diagrams could be used to experimentally determine R using ohm's law? Assume an ideal voltmeter and an ideal ammeter.

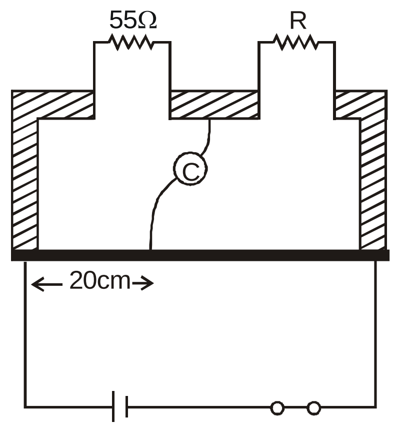
(A)


(B)


(C)


(D)


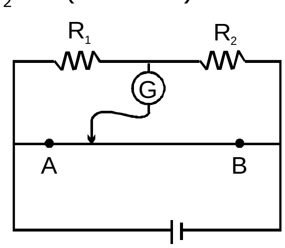
86. Shown in the figure below is a meter-bridge set up with null deflection in the galvanometer. The value of the unknown resistor R is



(A) 220 Ω (B) 110 Ω
(C) 55 Ω (D) 13.75 Ω

87. In a metre bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balnaced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y ?
(A) 50 cm (B) 80 cm
(C) 40 cm (D) 70 cm

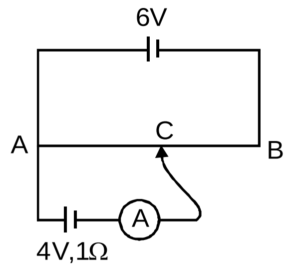
88. In the figure shown for gives values of R_1 and R_2 the balance point for Jockey is at 40 cm from A. When R_2 is shunted by a resistance of 10 Ω, balance shifts to 50 cm. R_1 and R_2 are (AB = 1m)



(A) $\frac{10}{3}\Omega, 5\Omega$ (B) 20Ω, 30Ω

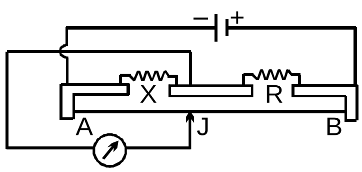
(C) 10Ω, 15Ω (D) 5Ω, $\frac{15}{2}\Omega$

89. A 6V battery of negligible internal resistance is connected across a uniform wire of length 1m. The positive terminal of another battery of emf 4V and internal resistance 1Ω is joined to the point A as shown in figure. The ammeter shows zero deflection when the jockey touches the wire at the point C. The AC is equal to



(A) 2/3 m (B) 1/3 m
(C) 3/5 m (D) 1/2 m

90. The figure shows a metre- bridge circuit, with AB = 100 cm, X = 12Ω and R = 18Ω, and the jockey J in the position of balance. If R is now made 8 Ω, through what distance will J have to be moved to obtain balance ?



(A) 10 cm (B) 20 cm
(C) 30 cm (D) 40 cm

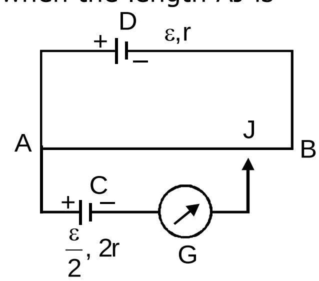
91. A potentiometer wire has length 10 m and resistance 10Ω. It is connected to a battery of EMF 11 volt and internal resistance 1Ω, then the potential gradient in the wire is
(A) 10 V/m (B) 1 V/m
(C) 0.1 V/m (D) none

92. The length of a potentiometer wire is l. A cell of emf E is balanced at a length $l/3$ from the positive end of the wire. if the length of the wire is increased by $l/2$. At what distance will the same cell give a balance point.

(A) $\frac{2l}{3}$ (B) $\frac{l}{2}$

(C) $\frac{l}{6}$ (D) $\frac{4l}{3}$

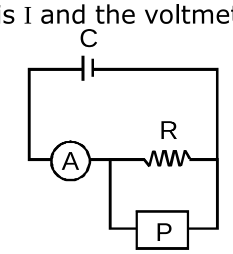
93. In the figure, the potentiometer wire AB of length L and resistance 9r is joined to the cell D of emf ε and internal resistance r. The cell C's emf is ε/2 and its internal resistance is 2r. The galvanometer G will show no deflection when the length AJ is



(A) $\frac{4L}{9}$ (B) $\frac{5L}{9}$

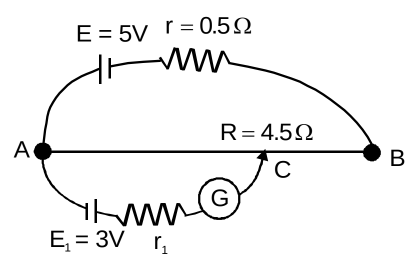
(C) $\frac{7L}{18}$ (D) $\frac{11L}{18}$

94. An ammeter A of finite resistance, and a resistor R are joined in series to an ideal cell C. A potentiometer P is joined in parallel to R. The ammeter reading is I_0 and the potentiometer reading is V_0. P is now replaced by a voltmeter of finite resistance. The ammeter reading now is I and the voltmeter reading is V.



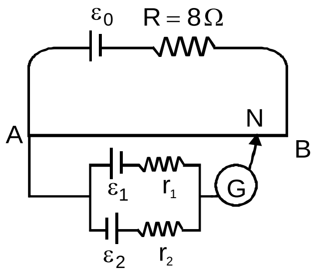
(A) $I > I_0$, $V < V_0$ (B) $I > I_0$, $V = V_0$
(C) $I = I_0$, $V < V_0$ (D) $I < I_0$, $V = V_0$

95. In the given potentiometer circuit length of the wire AB is 3m and resistance is R = 4.5 Ω. The length AC for no deflection in galvanometer is



(A) 2 m (B) 1.8 m
(C) dependent on r_1 (D) none of these

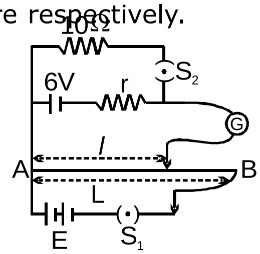
96. A battery of emf E_0 = 12 V is connected across a 4m long uniform wire having resistance 4Ω/m. The cells of small emfs ε_1 = 2V and ε_2 = 4V having internal resistance 2Ω and 6Ω respectively, are connected as shown in the figure. If galvanometer shows no deflection at the point N, the distance of point N from the point A is equal to



(A) $\frac{1}{6}$m (B) $\frac{1}{3}$m

(C) 25 cm (D) 50 cm

97. In the arrangement shown in figure when the switch S_2 is open, the galvanometer shows no deflection for l = L/2. When the switch S_2 is closed, the galvanometer shows no deflection for l = 5L/12. The internal resistance (r) of 6 V cell, and the emf E of the other battery are respectively.



(A) 3Ω, 8V (B) 2Ω, 12V

(C) 2Ω, 24V (D) 3Ω, 12V

98. Statement-1 : When two conducting wires of different resistivity having same cross section area are joined in series, the electric field in them would be equal when they carry current.

Statement-2 : When wires are in series they carry equal current.

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is** a correct explanation for STATEMENT-1

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is NOT** a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(D) STATEMENT-1 is False, STATEMENT-2 is True

99. Statement-1 : Potential difference across the terminals of a battery is always less than its emf.

Statement-2 : A battery always has some internal resistance.

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is** a correct explanation for STATEMENT-1

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is NOT** a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(D) STATEMENT-1 is False, STATEMENT-2 is True

100. Statement-1 : Knowing that rating is done at steady state of the filament, an electric bulb connected to a source having rated voltage consumes more than rated power just after it is switched on.

Statement-2 : When filament is at room temperature its resistance is less than its resistance when the bulb is fully illuminated

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is** a correct explanation for STATEMENT-1

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is NOT** a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(D) STATEMENT-1 is False, STATEMENT-2 is True

101. Statement-1 : When a battery is supplying power to a circuit, work done by electrostatic forces on electrolyte ions inside the battery is positive

Statement-2 : Electric field is directed from positive to negative electrode inside a battery

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is** a correct explanation for STATEMENT-1

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is NOT** a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(D) STATEMENT-1 is False, STATEMENT-2 is True

102. Statement-1 : Conductivity of a metallic conductor decreases with increase in temperature.

Statement-2 : On increasing temperature the number of free electrons in the metallic conductar decreases.

(A) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is** a correct explanation for STATEMENT-1

(B) STATEMENT-1 is True, STATEMENT-2 is True; STATEMENT-2 **is NOT** a correct explanation for STATEMENT-1

(C) STATEMENT-1 is True, STATEMENT-2 is False

(D) STATEMENT-1 is False, STATEMENT-2 is True