EXERCISE-I

Charge and coulombs Law

1. The resistance of a wire is 20 *ohms*. It is so stretched that the length becomes three times, then the new resistance of the wire will be
(A) 6.67 *ohms* (B) 60.0 *ohms*
(C) 120 *ohms* (D) 180.0 *ohms*

2. The resistivity of a wire
(A) Increases with the length of the wire
(B) Decreases with the area of cross-section
(C) Decreases with the length and increases with the cross-section of wire
(D) None of the above statement is correct

3. *Ohm*'s law is true
(A) For metallic conductors at low temperature
(B) For metallic conductors at high temperature
(C) For electrolytes when current passes through them
(D) For diode when current flows

4. The example for non-*ohm*ic resistance is
(A) Copper wire (B) Carbon esistance
(C) Diode (D) Tungston wire

5. Drift velocity v_d varies with the intensity of electric field as per the relation
(A) $v_d \propto E$ (B) $v_d \propto \frac{1}{E}$
(C) $v_d = \text{constant}$ (D) $v_d \propto E^2$

6. On increasing the temperature of a conductor, its resistance increases because
(A) Relaxation time decreases
(B) Mass of the electrons increases
(C) Electron density decreases
(D) None of the above

7. In a conductor 4 *coulombs* of charge flows for 2 *seconds*. The value of electric current will be
(A) 4 *volts* (B) 4 *amperes*
(C) 2 *amperes* (D) 2 *volts*

8. The specific resistance of a wire is ρ, its volume is $3\,m^3$ and its resistance is 3 *ohms*, then its length will be
(A) $\sqrt{\frac{1}{\rho}}$ (B) $\frac{3}{\sqrt{\rho}}$
(C) $\frac{1}{\rho}\sqrt{3}$ (D) $\rho\sqrt{\frac{1}{3}}$

9. 62.5×10^{18} electrons per second are flowing through a wire of area of cross-section $0.1\,m^2$, the value of current flowing will be
(A) 1 A (B) 0.1 A
(C) 10 A (D) 0.11 A

10. A piece of wire of resistance 4 *ohms* is bent through $180°$ at its mid point and the two halves are twisted together, then the resistance is
(A) 8 *ohms* (B) 1 *ohm*
(C) 2 *ohms* (D) 5 *ohms*

11. The positive temperature coefficient of resistance is for
(A) Carbon (B) Germanium
(C) Copper (D) An electrolyte

12. The fact that the conductance of some metals rises to infinity at some temperature below a few Kelvin is called
(A) Thermal conductivity
(B) Optical conductivity
(C) Magnetic conductivity
(D) Superconductivity

13. Dimensions of a block are $1\,cm\times1\,cm\times100\,cm$. If specific resistance of its material is $3\times10^{-7}\,ohm-m$, then the resistance between the opposite rectangular faces is
(A) $3\times10^{-9}\,ohm$ (B) $3\times10^{-7}\,ohm$
(C) $3\times10^{-5}\,ohm$ (D) $3\times10^{-3}\,ohm$

14. In the above question, the resistance between the square faces is

(A) $3\times10^{-9}\,ohm$ (B) $3\times10^{-7}\,ohm$

(C) $3\times10^{-5}\,ohm$ (D) $3\times10^{-3}\,ohm$

15. There is a current of 20 amperes in a copper wire of 10^{-6} square metre area of cross-section. If the number of free electrons per cubic metre is 10^{29}, then the drift velocity is

(A) $125\times10^{-3}\,m/\sec$

(B) $12.5\times10^{-3}\,m/sec$

(C) $1.25\times10^{-3}\,m/\sec$

(D) $1.25\times10^{-4}\,m/\sec$

16. The electric intensity E, current density j and specific resistance k are related to each other by the relation

(A) $E = j/k$ (B) $E = jk$

(C) $E = k/j$ (D) $k = jE$

17. The resistance of a wire of uniform diameter d and length L is R. The resistance of another wire of the same material but diameter $2d$ and length $4L$ will be

(A) $2R$ (B) R

(C) $R/2$ (D) $R/4$

18. There is a current of 1.344 *amp* in a copper wire whose area of cross-section normal to the length of the wire is 1 mm^2. If the number of free electrons per cm^3 is 8.4×10^{22}, then the drift velocity would be

(A) $1.0\,mm/\sec$ (B) $1.0\,m/\sec$

(C) $0.1\,mm/sec$ (D) $0.01\,mm/sec$

19. It is easier to start a car engine on a hot day than on a cold day. This is because the internal resistance of the car battery

(A) Decreases with rise in temperature

(B) Increases with rise in temperature

(C) Decreases with a fall in temperature

(D) Does not change with a change in temperature

20. 5 *amperes* of current is passed through a metallic conductor. The charge flowing in one minute in coulombs will be

(A) 5 (B) 12

(C) 1/12 (D) 300

21. A uniform wire of resistance R is uniformly compressed along its length, until its radius becomes n times the original radius. Now resistance of the wire becomes

(A) $\frac{R}{n^4}$ (B) $\frac{R}{n^2}$

(C) $\frac{R}{n}$ (D) nR

22. The resistance of a conductor is 5 *ohm* at $50^\circ C$ and 6 *ohm* at $100^\circ C$. Its resistance at $0^\circ C$ is

(A) 1 *ohm* (B) 2 *ohm*

(C) 3 *ohm* (D) 4 *ohm*

23. If an electron revolves in the path of a circle of radius of $0.5\times10^{-10}\,m$ at frequency of 5×10^{15} *cycles/s* the electric current in the circle is (Charge of an electron = $1.6\times10^{-19}\,C$)

(A) 0.4 *mA* (B) 0.8 *mA*

(C) 1.2 *mA* (D) 1.6 *mA*

24. Equal potentials are applied on an iron and copper wire of same length. In order to have the same current flow in the two wires, the ratio *r* (iron)/*r* (copper) of their radii must be (Given that specific resistance of iron = 1.0×10^{-7} *ohm–m* and specific resistance of copper = 1.7×10^{-8} *ohm-m*)

(A) About 1.2 (B) About 2.4

(C) About 3.6 (D) About 4.8

25. An electron (charge = 1.6×10^{-19} *coulomb*) is moving in a circle of radius $5.1\times10^{-11}\,m$ at a frequency of 6.8×10^{15} *revolutions/sec*. The equivalent current is approximately

(A) 5.1×10^{-3} *amp* (B) 6.8×10^{-3} *amp*

(C) 1.1×10^{-3} *amp* (D) 2.2×10^{-3} *amp*

26. A rod of a certain metal is 1.0 *m* long and 0.6 *cm* in diameter. Its resistance is 3.0×10^{-3} *ohm*. Another disc made of the same metal is 2.0 *cm* in diameter and 1.0 *mm* thick. What is the resistance between the round faces of the disc

(A) 1.35×10^{-8} *ohm* (B) 2.70×10^{-7} *ohm*

(C) 4.05×10^{-6} *ohm* (D) 8.10×10^{-5} *ohm*

27. At what temperature will the resistance of a copper wire become three times its value at $0^{o}C$ (Temperature coefficient of resistance for copper = 4×10^{-3} *per* ^{o}C)

(A) $400^{o}C$ (B) $450^{o}C$

(C) $500^{o}C$ (D) $550^{o}C$

28. An electron revolves 6×10^{15} *times/sec* in circular loop. The current in the loop is

(A) 0.96 mA (B) 0.96 μA

(C) 28.8 A (D) None of these

29. The charge of an electron is 1.6×10^{-19} C. How many electrons strike the screen of a cathode ray tube each *second* when the beam current is 16 mA

(A) 10^{17} (B) 10^{19}

(C) 10^{-19} (D) 10^{-17}

30. If potential $V = 100 \pm 0.5\, Volt$ and current $I = 10 \pm 0.2$ *amp* are given to us. Then what will be the value of resistance

(A) $10 \pm 0.7\, ohm$ (B) $5 \pm 2\, ohm$

(C) $0.1 \pm 0.2 ohm$ (D) None of these

31. What length of the wire of specific resistance $48 \times 10^{-8}\, \Omega\, m$ is needed to make a resistance of 4.2 Ω (diameter of wire = 0.4 mm)

(A) 4.1 m (B) 3.1 m

(C) 2.1 m (D) 1.1 m

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

(A) Each of these increases

(B) Each of these decreases

(C) Copper strip increases and that of germanium decreases

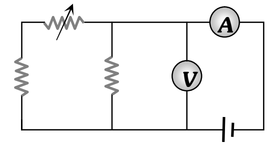
(D) Copper strip decreases and that of germanium increases

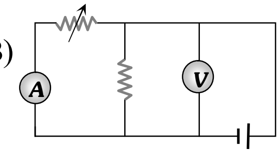
33. The length of a given cylindrical wire is increased by 100 %. Due to the consequent decrease in diameter the change in the resistance of the wire will be

(A) 300 % (B) 200 %

(C) 100 % (D) 50 %

34. Express which of the following setups can be used to verify Ohm's law

(A)


(B)


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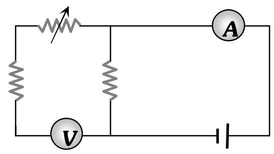
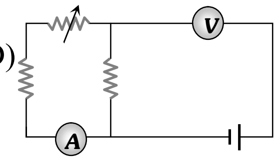


(D)


35. We have two wires A and B of same mass and same material. The diameter of the wire A is half of that B. If the resistance of wire A is 24 *ohm* then the resistance of wire B will be

(A) 12 *Ohm* (B) 3.0 *Ohm*

(C) 1.5 *Ohm* (D) None of the above

36. In a hydrogen discharge tube it is observed that through a given cross-section 3.13×10^{15} electrons are moving from right to left and 3.12×10^{15} protons are moving from left to right. What is the electric current in the discharge tube and what is its direction

(A) $1 mA$ towards right (B) $1 mA$ towards left

(C) $2 mA$ towards left (D) $2 mA$ towards right

37. A steady current i is flowing through a conductor of uniform cross-section. Any segment of the conductor has

(A) Zero charge

(B) Only positive charge

(C) Only negative charge

(D) Charge proportional to current i

38. The length of the wire is doubled. Its conductance will be

(A) Unchanged

(B) Halved

(C) Quadrupled

(D) 1/4 of the original value

39. A source of e.m.f. E = 15 V and having negligible internal resistance is connected to a variable resistance so that the current in the circuit increases with time as i = 1.2 t + 3. Then, the total charge that will flow in first five second will be

(A) 10 C (B) 20 C

(C) 30 C (D) 40 C

40. The new resistance of wire of $R\ \Omega$, whose radius is reduced half, is

(A) $16\ R$ (B) $3\ R$

(C) $2R$ (D) R

Grouping of Resistances

41. Three resistances of one *ohm* each are connected in parallel. Such connection is again connected with $2/3\Omega$ resistor in series. The resultant resistance will be

(A) $\frac{5}{3}\Omega$ (B) $\frac{3}{2}\Omega$

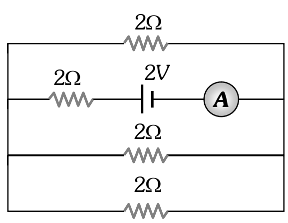
(C) 1Ω (D) $\frac{2}{3}\Omega$

42. The lowest resistance which can be obtained by connecting 10 resistors each of 1/10 *ohm* is

(A) $1/250\Omega$ (B) $1/200\Omega$

(C) $1/100\Omega$ (D) $1/10\Omega$

43. The reading of the ammeter as per figure shown is



(A) $\frac{1}{8}A$

(B) $\frac{3}{4}A$

(C) $\frac{1}{2}A$

(D) 2 A

44. Three resistors each of 2 *ohm* are connected together in a triangular shape. The resistance between any two vertices will be

(A) 4/3 *ohm* (B) 3/4 *ohm*

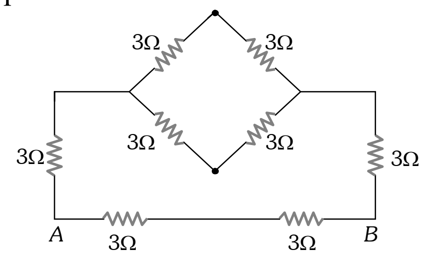
(C) 3 *ohm* (D) 6 *ohm*

45. There are n similar conductors each of resistance R. The resultant resistance comes out to be x when connected in parallel. If they are connected in series, the resistance comes out to be

(A) x/n^2 (B) n^2x

(C) x/n (D) nx

46. Equivalent resistance between A and B will be



(A) 2 *ohm* (B) 18 *ohm*

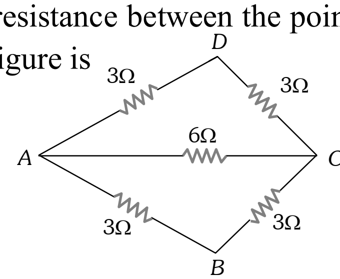
(C) 6 *ohm* (D) 3.6 *ohm*

47. A wire has a resistance of 12 *ohm*. It is bent in the form of equilateral triangle. The effective resistance between any two corners of the triangle is

(A) 9 *ohms* (B) 12 *ohms*

(C) 6 *ohms* (D) 8/3 *ohms*

48. The effective resistance between the points A and B in the figure is



(A) 5Ω

(B) 2Ω

(C) 3Ω

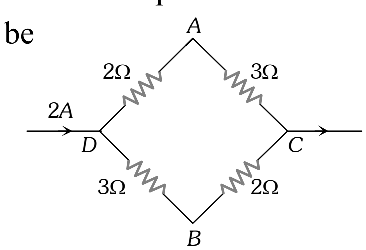
(D) 4Ω

49. Three resistances of magnitude 2, 3 and 5 *ohm* are connected in parallel to a battery of 10 volts and of negligible resistance. The potential difference across 3Ω resistance will be

(A) 2 *volts* (B) 3 *volts*

(C) 5 *volts* (D) 10 *volts*

50. A current of 2 A flows in a system of conductors as shown. The potential difference $(V_A - V_B)$ will be



(A) $+2V$

(B) $+1V$

(C) $-1V$

(D) $-2V$

51. A cell of negligible resistance and e.m.f. 2 volts is connected to series combination of 2, 3 and 5 *ohm*. The potential difference in volts between the terminals of 3 *ohm* resistance will be

(A) 0.6 (B) 2/3

(C) 3 (D) 6

52. Four wires of equal length and of resistances 10 *ohms* each are connected in the form of a square. The equivalent resistance between two opposite corners of the square is

(A) 10 ohm (B) 40 ohm
(C) 20 ohm (D) 10/4 ohm

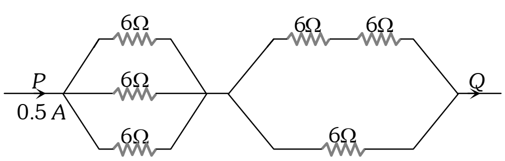
53. Two resistors are connected (A) in series (B) in parallel. The equivalent resistance in the two cases are 9 *ohm* and 2 *ohm* respectively. Then the resistances of the component resistors are

(A) 2 *ohm* and 7 *ohm*
(B) 3 *ohm* and 6 *ohm*
(C) 3 *ohm* and 9 *ohm* (D) 5 *ohm* and 4 *ohm*

54. Resistors of 1, 2, 3 *ohm* are connected in the form of a triangle. If a 1.5 volt cell of negligible internal resistance is connected across 3 *ohm* resistor, the current flowing through this resistance will be

(A) 0.25 *amp* (B) 0.5 *amp*
(C) 1.0 *amp* (D) 1.5 *amp*

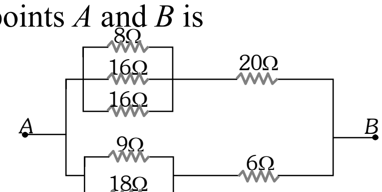
55. Resistances of 6 *ohm* each are connected in the manner shown in adjoining figure. With the current 0.5 *ampere* as shown in figure, the potential difference $V_P - V_Q$ is



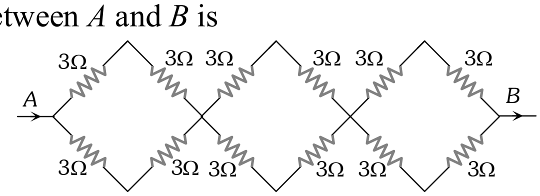
(A) 3.6 V (B) 6.0 V
(C) 3.0 V (D) 7.2 V

56. The equivalent resistance of the arrangement of resistances shown in adjoining figure between the points *A* and *B* is

(A) 6 *ohm*
(B) 8 *ohm*
(C) 16 *ohm*
(D) 24 *ohm*



57. In the network of resistors shown in the adjoining figure, the equivalent resistance between *A* and *B* is

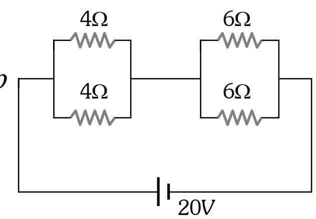


(A) 54 *ohm* (B) 18 *ohm*
(C) 36 *ohm* (D) 9 *ohm*

58. A wire is broken in four equal parts. A packet is formed by keeping the four wires together. The resistance of the packet in comparison to the resistance of the wire will be

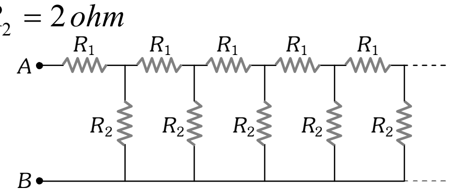
(A) Equal (B) One fourth
(C) One eight (D) $\frac{1}{16}th$

59. Four resistances are connected in a circuit in the given figure. The electric current flowing through 4 *ohm* and 6 *ohm* resistance is respectively



(A) 2 *amp* and 4 *amp*
(B) 1 *amp* and 2 *amp*
(C) 1 *amp* and 1 *amp*
(D) 2 *amp* and 2 *amp*

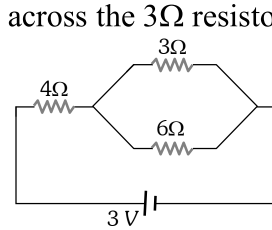
60. An infinite sequence of resistance is shown in the figure. The resultant resistance between *A* and *B* will be, when $R_1 = 1\,ohm$ and $R_2 = 2\,ohm$



(A) Infinity (B) 1Ω
(C) 2Ω (D) 1.5Ω

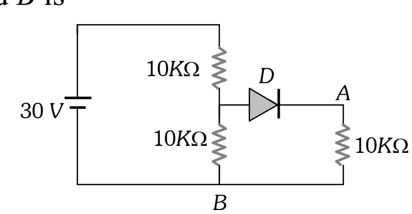
61. The potential drop across the 3Ω resistor is

(A) 1 *V*
(B) 1.5 *V*
(C) 2 *V*
(D) 3 *V*

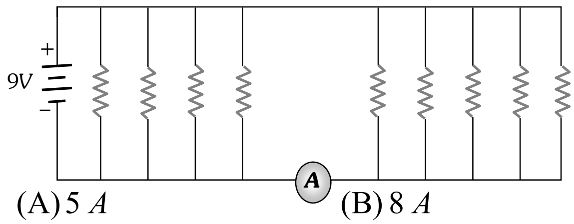


62. In the given figure, potential difference between *A* and *B* is

(A) 0
(B) 5 *volt*
(C) 10 *volt*
(D) 15 *volt*



63. If each resistance in the figure is of 9 Ω then reading of ammeter is



(A) 5 A (B) 8 A
(C) 2 A (D) 9 A

64. Four resistances 10 Ω, 5 Ω, 7 Ω and 3 Ω are connected so that they form the sides of a rectangle *AB, BC, CD* and *DA* respectively. Another resistance of 10 Ω is connected across the diagonal *AC*. The equivalent resistance between *A* and *B* is

(A) 2 Ω (B) 5 Ω
(C) 7 Ω (D) 10 Ω

65. Two wires of equal diameters, of resistivities ρ_1 and ρ_2 and lengths l_1 and l_2, respectively, are joined in series. The equivalent resistivity of the combination is

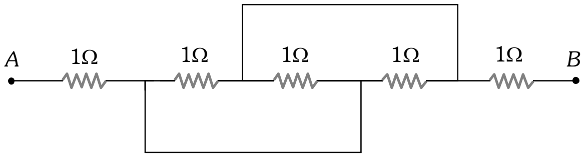
(A) $\dfrac{\rho_1 l_1 + \rho_2 l_2}{l_1 + l_2}$ (B) $\dfrac{\rho_1 l_2 + \rho_2 l_1}{l_1 - l_2}$

(C) $\dfrac{\rho_1 l_2 + \rho_2 l_1}{l_1 + l_2}$ (D) $\dfrac{\rho_1 l_1 - \rho_2 l_2}{l_1 - l_2}$

66. Four resistances of 100 Ω each are connected in the form of square. Then, the effective resistance along the diagonal points is

(A) 200 Ω (B) 400 Ω
(C) 100 Ω (D) 150 Ω

67. Equivalent resistance between the points *A* and *B* is (in Ω)



(A) $\dfrac{1}{5}$ (B) $1\dfrac{1}{4}$

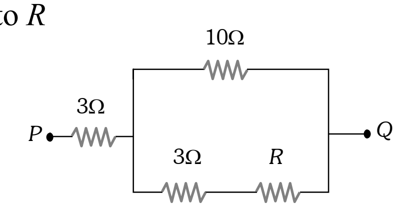
(C) $2\dfrac{1}{3}$ (D) $3\dfrac{1}{2}$

68. Two wires of the same material and equal length are joined in parallel combination. If one of them has half the thickness of the other and the thinner wire has a resistance of 8 *ohms*, the resistance of the combination is equal to

(A) $\dfrac{5}{8}$ *ohms* (B) $\dfrac{8}{5}$ *ohms*

(C) $\dfrac{3}{8}$ *ohms* (D) $\dfrac{8}{3}$ *ohms*

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



(A) 3 *ohms*
(B) $\sqrt{39}$ *ohms*
(C) $\sqrt{69}$ *ohms*
(D) 10 *ohms*

70. A uniform wire of resistance 9 Ω is cut into 3 equal parts. They are connected in the form of equilateral triangle *ABC*. A cell of e.m.f. 2 *V* and negligible internal resistance is connected across *B* and *C*. Potential difference across *AB* is

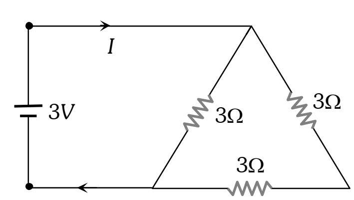
(A) 1 V (B) 2 V
(C) 3 V (D) 0.5 V

71. Three unequal resistors in parallel are equivalent to a resistance 1 *ohm*. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest of the three resistances in *ohms* is

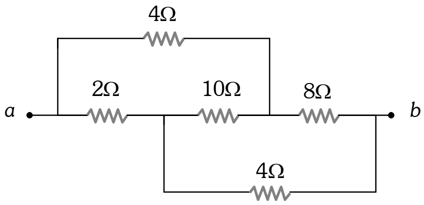
(A) 4 (B) 6
(C) 8 (D) 12

72. 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) 1/3 A
(B) 1 A
(C) 1.5 A
(D) 2 A

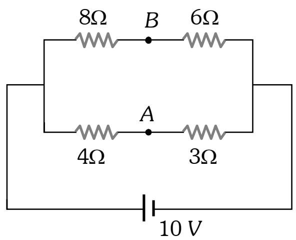


73. Find the equivalent resistance between the points *a* and *b*



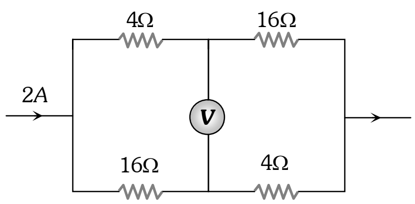
(A) 2 Ω
(B) 4 Ω
(C) 8 Ω
(D) 16 Ω

74. The potential difference between point *A* & *B* is



(A) $\frac{20}{7}$ V
(B) $\frac{40}{7}$ V
(C) $\frac{10}{7}$ V
(D) 0

75. In the circuit shown below, The reading of the voltmeter *V* is



(A) 12 *V*
(B) 8 *V*
(C) 20 *V*
(D) 16 *V*

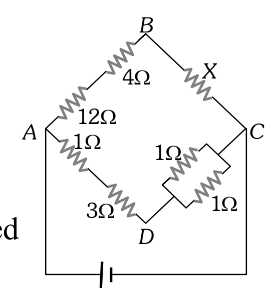
76. A wire has a resistance of 12 *ohm*. It is bent in the form of equilateral triangle. The effective resistance between any two corners of the triangle is

(A) 9 *ohms* (B) 12 *ohms*
(C) 6 *ohms* (D) 8/3 *ohms*

77. A series combination of two resistors 1 Ω each is connected to a 12 *V* battery of internal resistance 0.4 Ω. The current flowing through it will be

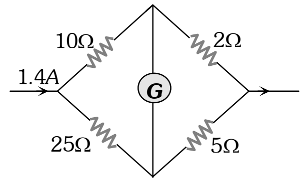
(A) 3.5 *A* (B) 5 *A*
(C) 6 *A* (D) 10 *A*

78. In the circuit shown in the adjoining figure, the current between *B* and *D* is zero, the unknown resistance is of



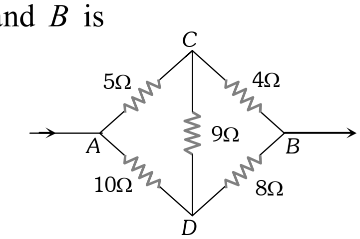
(A) 4Ω
(B) 2Ω
(C) 3Ω
(D) *em.f.* of a cell is required to find the value of *X*

79. In the circuit shown in the figure, the current flowing in 2Ω resistance



(A) 1.4 *A*
(B) 1.2 *A*
(C) 0.4 *A*
(D) 1.0 *A*

80. Five resistors are connected as shown in the diagram. The equivalent resistance between *A* and *B* is



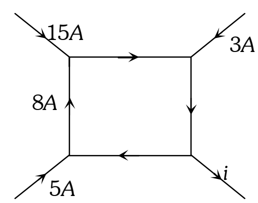
(A) 6 *ohm*
(B) 9 *ohm*
(C) 12 *ohm*
(D) 15 *ohm*

Kirchhoff's Law, Cells

81. The electromotive force of a primary cell is 2 *volts*. When it is short-circuited it gives a current of 4 *amperes*. Its internal resistance in *ohm*s is

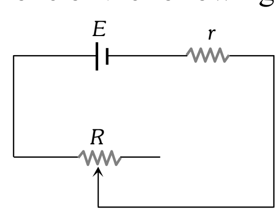
(A) 0.5 (B) 5.0
(C) 2.0 (D) 8.0

82. The figure shows a network of currents. The magnitude of currents is shown here. The current *i* will be



(A) 3 *A*
(B) 13 *A*
(C) 23 *A*
(D) – 3 *A*

83. A battery of e.m.f. *E* and internal resistance *r* is connected to a variable resistor *R* as shown here. Which one of the following is true



(A) Potential difference across the terminals of the battery is maximum when $R = r$
(B) Power delivered to the resistor is maximum when $R = r$
(C) Current in the circuit is maximum when $R = r$
(D) Current in the circuit is maximum when $R \gg r$

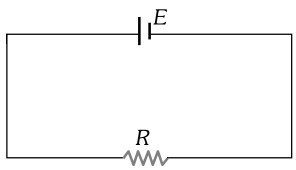
84. A dry cell has an e.m.f. of 1.5 V and an internal resistance of 0.05Ω. The maximum current obtainable from this cell for a very short time interval is

(A) 30 A (B) 300 A

(C) 3 A (D) 0.3 A

85. Consider the circuit given here with the following parameters

E.M.F. of the cell = 12 V. Internal resistance of the cell $= 2\Omega$. Resistance $R = 4\Omega$



Which one of the following statements in true

(A) Rate of energy loss in the source is = 8 W

(B) Rate of energy conversion in the source is 16 W

(C) Power output in is = 8 W

(D) Potential drop across R is = 16 V

86. A current of two amperes is flowing through a cell of e.m.f. 5 *volts* and internal resistance 0.5 *ohm* from negative to positive electrode. If the potential of negative electrode is 10V, the potential of positive electrode will be

(A) 5 V (B) 14 V

(C) 15 V (D) 16 V

87. 100 cells each of e.m.f. 5 V and internal resistance 1 *ohm* are to be arranged so as to produce maximum current in a 25 *ohms* resistance. Each row is to contain equal number of cells. The number of rows should be

(A) 2 (B) 4

(C) 5 (D) 10

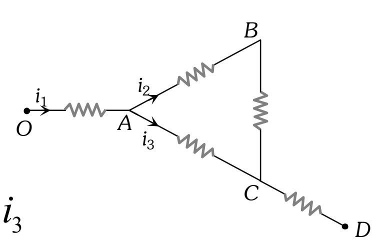
88. The current in the arm CD of the circuit will be

(A) $i_1 + i_2$

(B) $i_2 + i_3$

(C) $i_1 + i_3$

(D) $i_1 - i_2 + i_3$



89. When a resistance of 2 *ohm* is connected across the terminals of a cell, the current is 0.5 A. When the resistance is increased to 5 *ohm*, the current is 0.25 A. The e.m.f. of the cell is

(A) 1.0 V (B) 1.5 V

(C) 2.0 V (D) 2.5 V

90. Two non-ideal identical batteries are connected in parallel. Consider the following statements

(i)The equivalent e.m.f. is smaller than either of the two e.m.f.s

(ii) The equivalent internal resistance is smaller than either of the two internal resistances

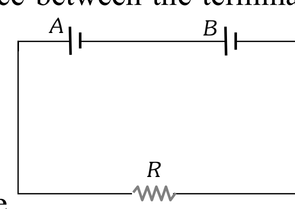
(A) Both (i) and (ii) are correct

(B) (i) is correct but (ii) is wrong

(C) (ii) is correct but (i) is wrong

(D) Both (i) and (ii) are wrong

91. Two batteries A and B each of e.m.f. 2 V are connected in series to an external resistance R = 1 *ohm*. If the internal resistance of battery A is 1.9 *ohms* and that of B is 0.9 *ohm*, what is the potential difference between the terminals of battery A



(A) 2 V

(B) 3.8 V

(C) Zero

(D) None of the above

92. When a resistor of 11 Ω is connected in series with an electric cell, the current flowing in it is 0.5 A. Instead, when a resistor of 5 Ω is connected to the same electric cell in series, the current increases by 0.4 A. The internal resistance of the cell is

(A) 1.5 Ω (B) 2 Ω

(C) 2.5 Ω (D) 3.5 Ω

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

(A) Electrodes of the cell

(B) Vessel of the cell

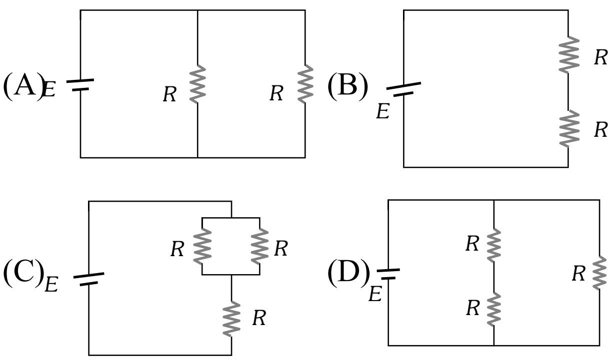
(C) Electrolyte used in the cell

(D) Material used in the cell

94. How much work is required to carry a 6 μC charge from the negative terminal to the positive terminal of a 9 V battery

(A) $54 \times 10^{-3}\,J$ (B) $54 \times 10^{-6}\,J$
(C) $54 \times 10^{-9}\,J$ (D) $54 \times 10^{-12}\,J$

95. Consider four circuits shown in the figure below. In which circuit power dissipated is greatest (Neglect the internal resistance of the power supply)



96. The *emf* of a battery is 2 V and its internal resistance is 0.5 Ω. The maximum power which it can deliver to any external circuit will be

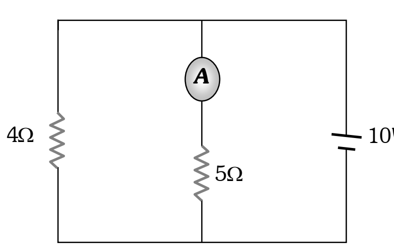
(A) 8 *Watt* (B) 4 *Watt*
(C) 2 *Watt* (D) None of the above

97. Kirchoff's I law and II law of current, proves the

(A) Conservation of charge and energy
(B) Conservation of current and energy
(C) Conservation of mass and charge
(D) None of these

98. In the circuit, the reading of the ammeter is (assume internal resistance of the battery be zero)

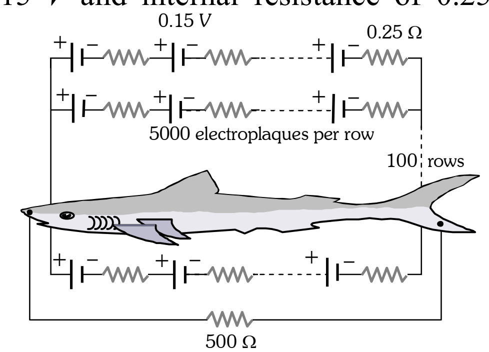
(A) $\frac{40}{29} A$
(B) $\frac{10}{9} A$
(C) $\frac{5}{3} A$
(D) 2 A



99. In the above question, if the internal resistance of the battery is 1 *ohm*, then what is the reading of ammeter

(A) 5/3 A (B) 40/29 A
(C) 10/9 A (D) 1 A

100. Eels are able to generate current with biological cells called electroplaques. The electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of the fish containing 5000 electroplaques. The arrangement is suggestively shown below. Each electroplaques has an emf of 0.15 V and internal resistance of 0.25 Ω



The water surrounding the eel completes a circuit between the head and its tail. If the water surrounding it has a resistance of 500 Ω, the current an eel can produce in water is about

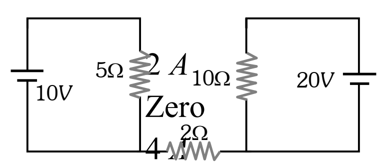
(A) 1.5 A (B) 3.0 A
(C) 15 A (D) 30 A

101. The maximum power drawn out of the cell from a source is given by (where r is internal resistance)

(A) $E^2 / 2r$ (B) $E^2 / 4r$
(C) E^2 / r (D) $E^2 / 3r$

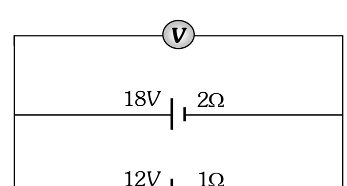
102. Find out the value of current through 2Ω resistance for the given circuit

(A) 5 A
(B) 2 A
(C) Zero
(D) 4 A



103. Two batteries, one of emf 18 *volts* and internal resistance 2Ω and the other of emf 12 *volt* and internal resistance 1Ω, are connected as shown. The voltmeter *V* will record a reading of

(A) 15 *volt*
(B) 30 *volt*
(C) 14 *volt*
(D) 18 *volt*



104. Two sources of equal emf are connected to an external resistance R. The internal resistances of the two sources are R_1 and R_2 $(R_2 > R_1)$. If the potential difference across the source having internal resistance R_2 is zero, then

(A) $R = R_1R_2 / (R_1 + R_2)$

(B) $R = R_1R_2 / (R_2 - R_1)$

(C) $R = R_2 \times (R_1 + R_2) / (R_2 - R_1)$

(D) $R = R_2 - R_1$

105. An energy source will supply a constant current into the load if its internal resistance is

(A) Zero

(B) Non-zero but less than the resistance of the load

(C) Equal to the resistance of the load

(D) Very large as compared to the load resistance

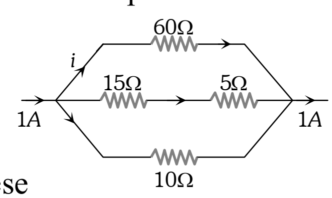
106. The magnitude of i in ampere unit is

(A) 0.1

(B) 0.3

(C) 0.6

(D) None of these



107. To draw maximum current from a combination of cells, how should the cells be grouped

(A) Series

(B) Parallel

(C) Mixed

(D) Depends upon the relative values of external and internal resistance

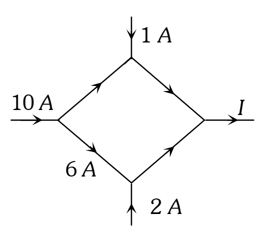
108. The figure shows a network of currents. The magnitude of currents is shown here. The current I will be

(A) 3 A

(B) 9 A

(C) 13 A

(D) 19 A



109. The n rows each containing m cells in series are joined in parallel. Maximum current is taken from this combination across an external resistance of 3Ω resistance. If the total number of cells used are 24 and internal resistance of each cell is 0.5 Ω then

(A) $m = 8, n = 3$ (B) $m = 6, n = 4$

(C) $m = 12, n = 2$ (D) $m = 2, n = 12$

110. A cell of constant e.m.f. first connected to a resistance R_1 and then connected to a resistance R_2. If power delivered in both cases is then the internal resistance of the cell is

(A) $\sqrt{R_1R_2}$ (B) $\sqrt{\dfrac{R_1}{R_2}}$

(C) $\dfrac{R_1 - R_2}{2}$ (D) $\dfrac{R_1 + R_2}{2}$

Different Measuring Instruments

111. If in the experiment of Wheatstone's bridge, the positions of cells and galvanometer are interchanged, then balance points will

(A) Change

(B) Remain unchanged

(C) Depend on the internal resistance of cell and resistance of galvanometer

(D) None of these

112. The resistance of a galvanometer is 90 *ohm*s. If only 10 percent of the main current may flow through the galvanometer, in which way and of what value, a resistor is to be used

(A) 10 *ohm*s in series

(B) 10 *ohm*s in parallel

(C) 810 *ohm*s in series

(D) 810 *ohm*s in parallel

113. Two cells when connected in series are balanced on 8m on a potentiometer. If the cells are connected with polarities of one of the cell is reversed, they balance on 2m. The ratio of e.m.f.'s of the two cells is

(A) 3 : 5 (B) 5 : 3

(C) 3 : 4 (D) 4 : 3

114. A voltmeter has a resistance of G *ohms* and range V *volts*. The value of resistance used in series to convert it into a voltmeter of range nV volts is

(A) nG (B) $(n-1)G$

(C) $\frac{G}{n}$ (D) $\frac{G}{(n-1)}$

115. Which of the following statement is wrong

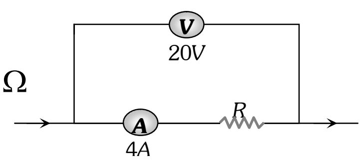
(A) Voltmeter should have high resistance

(B) Ammeter should have low resistance

(C) Ammeter is placed in parallel across the conductor in a circuit

(D) Voltmeter is placed in parallel across the conductor in a circuit

116. In the diagram shown, the reading of voltmeter is 20 V and that of ammeter is 4 A. The value of R should be (Consider given ammeter and voltmeter are not ideal)



(A) Equal to 5Ω

(B) Greater from 5Ω

(C) Less than 5Ω

(D) Greater or less than 5Ω depends on the material of R

117. A moving coil galvanometer has a resistance of 50Ω and gives full scale deflection for 10 mA. How could it be converted into an ammeter with a full scale deflection for $1A$

(A) $50/99\Omega$ in series

(B) $50/99\Omega$ in parallel

(C) 0.01Ω in series

(D) 0.01Ω in parallel

118. The current flowing through a coil of resistance 900 *ohms* is to be reduced by 90%. What value of shunt should be connected across the coil

(A) 90Ω (B) 100Ω

(C) 9Ω (D) 10Ω

119. A galvanometer of resistance 25Ω gives full scale deflection for a current of 10 *milliampere*, is to be changed into a voltmeter of range 100 V by connecting a resistance of 'R' in series with galvanometer. The value of resistance R in Ω is

(A) 10000 (B) 10025

(C) 975 (D) 9975

120. In a potentiometer circuit there is a cell of e.m.f. 2 *volt*, a resistance of 5 *ohm* and a wire of uniform thickness of length 1000 *cm* and resistance 15 *ohm*. The potential gradient in the wire is

(A) $\frac{1}{500}V/cm$ (B) $\frac{3}{2000}V/cm$

(C) $\frac{3}{5000}V/cm$ (D) $\frac{1}{1000}V/cm$

121. A voltmeter of resistance 1000Ω gives full scale deflection when a current of 100 mA flow through it. The shunt resistance required across it to enable it to be used as an ammeter reading 1 A at full scale deflection is

(A) 10000Ω (B) 9000Ω

(C) 222Ω (D) 111Ω

122. The resistance of 10 *metre* long potentiometer wire is 1*ohm*/*meter*. A cell of e.m.f. 2.2 *volts* and a high resistance box are connected in series to this wire. The value of resistance taken from resistance box for getting potential gradient of 2.2 *millivolt*/*metre* will be

(A) 790Ω (B) 810Ω

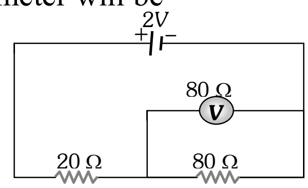
(C) 990Ω (D) 1000Ω

123. We have a galvanometer of resistance 25Ω. It is shunted by a 2.5Ω wire. The part of total current that flows through the galvanometer is given as

(A) $\frac{I}{I_0}=\frac{1}{11}$ (B) $\frac{I}{I_0}=\frac{1}{10}$

(C) $\frac{I}{I_0}=\frac{3}{11}$ (D) $\frac{I}{I_0}=\frac{4}{11}$

124. In the adjoining circuit, the e.m.f. of the cell is 2 *volt* and the internal resistance is negligible. The resistance of the voltmeter is 80 *ohm*. The reading of the voltmeter will be



(A) 0.80 *volt*
(B) 1.60 *volt*
(C) 1.33 *volt*
(D) 2.00 *volt*

125. If the resistivity of a potentiometer wire be ρ and area of cross-section be A, then what will be potential gradient along the wire

(A) $\frac{I\rho}{A}$ (B) $\frac{I}{A\rho}$
(C) $\frac{IA}{\rho}$ (D) $IA\rho$

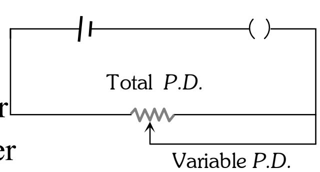
126. A voltmeter has resistance of 2000 *ohms* and it can measure upto $2V$. If we want to increase its range to 10 V, then the required resistance in series will be

(A) 2000Ω (B) 4000Ω
(C) 6000Ω (D) 8000Ω

127. For a cell of e.m.f. $2V$, a balance is obtained for 50 *cm* of the potentiometer wire. If the cell is shunted by a 2Ω resistor and the balance is obtained across 40 *cm* of the wire, then the internal resistance of the cell is

(A) 0.25Ω (B) 0.50Ω
(C) 0.80Ω (D) 1.00Ω

128. The arrangement as shown in figure is called as



(A) Potential divider
(B) Potential adder
(C) Potential substracter
(D) Potential multiplier

129. A potentiometer wire of length $1m$ and resistance 10 Ω is connected in series with a cell of *emf* $2V$ with internal resistance 1 Ω and a resistance box including a resistance R. If potential difference between the ends of the wire is 1 mV, the value of R is

(A) 20000 Ω (B) 19989 Ω
(C) 10000 Ω (D) 9989 Ω

130. In a balanced Wheatstone's network, the resistances in the arms Q and S are interchanged. As a result of this

(A) Network is not balanced
(B) Network is still balanced
(C) Galvanometer shows zero deflection
(D) Galvanometer and the cell must be interchanged to balance

131. A 36 Ω galvanometer is shunted by resistance of 4Ω. The percentage of the total current, which passes through the galvanometer is

(A) 8 % (B) 9 %
(C) 10 % (D) 91 %

132. An ammeter and a voltmeter of resistance R are connected in series to an electric cell of negligible internal resistance. Their readings are A and V respectively. If another resistance R is connected in parallel with the voltmeter

(A) Both A and V will increase
(B) Both A and V will decrease
(C) A will decrease and V will increase
(D) A will increase and V will decrease

133. A wire of length 100 *cm* is connected to a cell of *emf* 2 V and negligible internal resistance. The resistance of the wire is 3 Ω. The additional resistance required to produce a potential drop of 1 *milli volt* per *cm* is

(A) 60 Ω (B) 47 Ω
(C) 57 Ω (D) 35 Ω

134. A galvanometer of resistance 20 Ω is to be converted into an ammeter of range 1 A. If a current of 1 mA produces full scale deflection, the shunt required for the purpose is

(A) 0.01 Ω (B) 0.05 Ω
(C) 0.02 Ω (D) 0.04 Ω

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

(A) 10000 Ω
(B) 8000 Ω
(C) 4000 Ω
(D) All are equally good

136. 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

137. A 10 *m* long wire of 20Ω resistance is connected with a battery of 3 *volt* e.m.f. (negligible internal resistance) and a 10 Ω resistance is joined to it is series. Potential gradient along wire in volt per meter is

(A) 0.02 (B) 0.3
(C) 0.2 (D) 1.3

138. A potentiometer has uniform potential gradient across it. Two cells connected in series (i) to support each other and (ii) to oppose each other are balanced over 6*m* and 2*m* respectively on the potentiometer wire. The e.m.f.'s of the cells are in the ratio of

(A) 1 : 2 (B) 1 : 1
(C) 3 : 1 (D) 2 : 1

139. The material of wire of potentiometer is

(A) Copper (B) Steel
(C) Manganin (D) Aluminium

140. To convert a galvanometer into a voltmeter, one should connect a

(A) High resistance in series with galvanometer
(B) Low resistance in series with galvanometer
(C) High resistance in parallel with galvanometer
(D) Low resistance in parallel with galvanometer

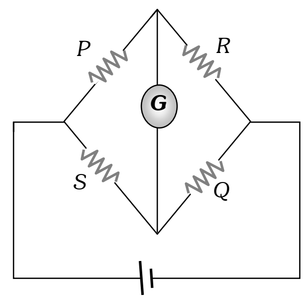
141. A galvanometer of 50 *ohm* resistance has 25 divisions. A current of 4×10^{-4} *ampere* gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 *volts*, it should be connected with a resistance of

(A) 2500 Ω as a shunt (B) 2450 Ω as a shunt
(C) 2550 Ω in series (D) 2450 Ω in series

142. In a metre bridge experiment null point is obtained at 20 *cm* from one end of the wire when resistance *X* is balanced 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 4*X* against *Y*

(A) 50 *cm* (B) 80 *cm*
(C) 40 *cm* (D) 70 *cm*

143. In the circuit given, the correct relation to a balanced Wheatstone bridge is



(A) $\frac{P}{Q} = \frac{R}{S}$

(B) $\frac{P}{Q} = \frac{S}{R}$

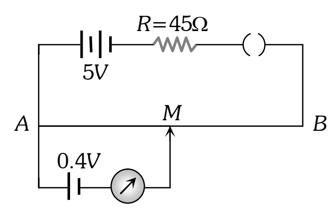
(C) $\frac{P}{R} = \frac{S}{Q}$

(D) None of these

144. A galvanometer coil of resistance 50 Ω, show full deflection of $100\mu A$. The shunt resistance to be added to the galvanometer, to work as an ammeter of range 10 *mA* is

(A) 5 Ω in parallel (B) 0.5 Ω in series
(C) 5 Ω in series (D) 0.5 Ω in parallel

145. In given figure, the potentiometer wire *AB* has a resistance of 5 Ω and length 10 *m*. The balancing length *AM* for the emf of 0.4 *V* is



(A) 0.4 *m*
(B) 4 *m*
(C) 0.8 *m*
(D) 8 *m*

146. A potentiometer consists of a wire of length 4 *m* and resistance 10 Ω. It is connected to cell of emf 2 *V*. The potential difference per unit length of the wire will be

(A) 0.5 *V/m* (B) 10 *V/m*
(C) 2 *V/m* (D) 5 *V/m*

147. A voltmeter essentially consists of

(A) A high resistance, in series with a galvanometer

(B) A low resistance, in series with a galvanometer

(C) A high resistance in parallel with a galvanometer

(D) A low resistance in parallel with a galvanometer

148. In a potentiometer experiment the balancing with a cell is at length 240 *cm*. On shunting the cell with a resistance of 2 Ω, the balancing length becomes 120 *cm*. The internal resistance of the cell is

(A) 4 Ω (B) 2 Ω

(C) 1 Ω (D) 0.5 Ω

149. With a potentiometer null point were obtained at 140 *cm* and 180 *cm* with cells of emf 1.1 *V* and one unknown *X* volts. Unknown emf is

(A) 1.1 *V* (B) 1.8 *V*

(C) 2.4 *V* (D) 1.41 *V*

150. A moving coil galvanometer of resistance 100Ω is used as an ammeter using a resistance 0.1Ω. The maximum deflection current in the galvanometer is $100\mu A$. Find the minimum current in the circuit so that the ammeter shows maximum deflection

(A) 100.1 *mA* (B) 1000.1 *mA*

(C) 10.01 *mA* (D) 1.01 *mA*