PHYSICS

BOOKS - MTG GUIDE

CURRENT ELECTRICITY

Illustration Solution

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

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2. A wire has resistance of 10Ω. If it is stretched by 1/10th of its length, then its resistance is nearly

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3. Potential difference of 100 V is applied to the ends of a copper wire one metre long. Calculate the average drift velocity of the electrons ? Compare it with thermal velocity at $27^{\circ} C$. Consider there is one conduction electron per atom. The density of copper is $9.0 \times 10^{3} kg / m^{3}$, Atomic mass of copper is 63.5 g. Avogadro's number $= 6.0 \times 10^{23}$ per gram-mole. Conductivity of copper is $5.81 \times 10^{7} \Omega^{-1} m^{-1}$. Boltzmann constant $= 1.38 \times 10^{23} JK^{-1}$.

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

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5. Calculate resultant resistance between the points X and Y in the circuit shown in figure.

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6. Six lead-acid type of secondary cells each of emf 2.0 V and internal resistance 0.015Ω are jouned in series to provide a supply to a resistance of 8.5Ω. What are the current drawn from the supply and its terminal voltage ?

(b) A secondary cells after long use has an emf of $1-9$ V and a large internal resistance of 380Ω. What maximum current can be drawn from the cell ? Could the cell drive the starting motor of a car ?

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7. Two identical cells of emf 1.5 V each joined in paralllel provide supply to an external circuit consisting of two resistances of 7Ω each joined in parallel. A very high resistance voltmeter reads the terminal voltage of cells to be 1.4 V. Calculate the internal resistance of each cell.

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8. Calculate the current in the arm AD as shown in figure. Each resistance is of 10Ω.

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9. In the given circuit, it is observed that the current I is independent of the value of the resistance R_6. Then the resistance values must satisfy.

A. $R_1R_2R_5 = R_3R_4R_6$

B. $\dfrac{1}{R_5} + \dfrac{1}{R_6} = \dfrac{1}{R_1 + R_2} + \dfrac{1}{R_3 + R_4}$

C. $R_1R_4 = R_2R_3$

D. $R_1R_3 = R_2R_4$

Answer: C

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10. In a potentiometer arrangment, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm`, what is the emf of the second cell ?

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1. The plot represents the flow of current through a wire at three different times. The ratio of charges flowing through the wire at different times is

A. $2:1:2$

B. $1:3:3$

C. $1:1:1$

D. $2:3:4$

Answer: C

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2. In a closed circuit, the current / (in ampere) at an instant of time t (in second) is given by I = $4 - 0.08t$. The number of electrons flowing in 50 s through the cross-section of the conductor is

A. 1.25×10^{19}

B. 6.25×10^{20}

C. 5.25×10^{19}

D. 2.55×10^{20}

Answer: B

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3. Current of 4.8 amperes is flowing through a conductor. The number of electrons per second will be

A. 10^{19}

B. 2×10^{19}

C. 3×10^{19}

D. 7×10^{20}

Answer: C

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4. A steady current is passing through a linear conductor of non-uniform cross-section. The net quantity of charge crossing any cross-section per second is.

A. proportional to the area of cross-section

B. inversely proportional to the area of cross-section

C. independent of the area of cross-section

D. dependent on the length of conductor

Answer: C

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5. In a certain particle accelerator, electrons emerge in pulses at the rate of 250 pulses pe second. Each pulse is of duration of 200 ns and the electrons in the pulse constitute a current of 250 mA. The number of electrons delivered by the accelerator per pulse is

A. 8.00×10^{10}

B. 5.00×10^{8}

C. 3.13×10^{11}

D. 9.60×10^{10}

Answer: C

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6. The density of copper is $9 \times 10^3 kgm^{-3}$ and its atomic mass is 63.5 u. Each copper atom provides one free electron. Estimate the number of free electrons per cubic metre in copper.

A. 10^{19}

B. 10^{23}

C. 10^{25}

D. 10^{29}

Answer: D

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7. The current flowing through wire depends on time as, $1 = 3t^2 + 2t + 5$

The charge flowing through the cross - section of the wire in time $t = 0$ to $t = 2$ second is

A. 22 C

B. 20 C

C. 18 C

D. 5 C

Answer: A

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8. Ampere-hour is a unit of

A. 3600 C

B. 3600 A

C. 3600 J

D. 3600 W

Answer: A

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9. If the electric current through an electric bulb is 3.2 A, the number of electrons flow through it in 1 second is

A. 2×10^{9}

B. 2×10^{19}

C. 3.2×10^{9}

D. 1.6×10^{18}

Answer: B

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10. The drift velocity of free electrons in a conductor is v, when a current i is flowing in it, Ifboth the radius and current are doubled, then the drift velocity will be :

A. v

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

C. $\frac{v}{4}$

D. $\frac{v}{8}$

Answer: B

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11. Current flows through a metallic conductor whose area of cross-section increases in the direction of the current. If we move in this direction.

A. the current will decrease

B. the current will increase

C. the drift velocity will increase

D. the drift velocity will decrease

Answer: D

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12. A conductor wire having 10^{29} free electrons $/m^3$ carries a current of 20A. If the cross-section of the wire is $1mm^2$, then the drift velocity of electrons will be :

A. $1.25 \times 10^{-4} ms^{-1}$

B. $1.25 \times 10^{-3} ms^{-1}$

C. $1.25 \times 10^{-5} ms^{-1}$

D. $6.25 \times 10^{-3} ms^{-1}$

Answer: B

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13. Give relation between drift velocity and electric field.

A. current density

B. current

C. resistivity

D. mobility

Answer: D

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14. A nichrome wire 50 cm long and one square millimetre cross- section carries a current of 4 A when connected to a 2 V battery. The resistivity of nichrome wire in ohm metre is

A. $1 \times 10^{-6} \Omega m$

B. $2 \times 10^{-7} \Omega m$

C. $4 \times 10^{-7} \Omega m$

D. $5 \times 10^{-7} \Omega m$

Answer: A

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15. The masses of the three wires of copper are in the ratio $5:3:1$ and their lengths are in the ratio $1:3:5$. The ratio of their electrical resistances is

A. $1:3:5$

B. $5:3:1$

C. $1:15:25$

D. $125:15:1$

Answer: D

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16. A copper wire of resistance R_0 is strerched till its length is increased to n times of its original length. What will be its new resistance?

A. 2R

B. 4R

C. 8R

D. 16R

Answer: B

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17. A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio l_B/l_A of their respective lengths must be

A. 2

B. 1

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

D. $\frac{1}{4}$

Answer: A

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18. The resistance of a 10 m long wire is 10 Ω. Its length is increased by 25% by stretching the wire uniformly . The resistance of wire will change to

A. 12.5Ω

B. 14.5Ω

C. 15.6Ω

D. 16.6Ω

Answer: C

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19. Two wires that are made up of two different materials whose specific resistance are in the ratio 2 : 3, length 3 : 4 and area 4 : 5. The ratio of their resistances is

A. $6:5$

B. $6:8$

C. $5:8$

D. $1:2$

Answer: C

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20. One kg of copper is drawn into a wire of 1 mm diameter and a wire of 2 mm diameter. The resistance of the two wires will be in the ratio

A. $2:1$

B. $1:2$

C. $16:1$

D. $4:1$

Answer: C

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21. A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure is

A. 3Ω

B. $6\pi\Omega$

C. 6Ω

D. $0.6\pi\Omega$

Answer: D

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22. A block has dimensions 1 cm, 2cm, 3cm Ratio of the maximum and minimum resistance between any two points of opposite faces of this block is

A. $9:1$

B. $1:9$

C. $18:1$

D. $1:6$

Answer: A

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23. A wire P has resistance of 20 ohm. Another wire Q of same material but length twice that of P has resistance of 8 ohm. If r is the radius of cross-section of P, the radius of cross-section of Q is

A. r

B. $\frac{r}{\sqrt{2}}$

C. $r\sqrt{5}$

D. $2r$

Answer: C

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24. Ohm's law is valid, when the temperature of the conductor is

A. V is directly proportional to I^3

B. the relation between V and I is non-unique

C. V is directly proportional to I^2

D. V depends on I linearly

Answer: D

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25. A resistance of 2Ω is to be made from a copper wire (specific resistance $1.7 \times 10^{-8} \Omega m$) using a wire of length 50 cm. The radius of the wire is

A. $0.0116 mm$

B. $0.0367mm$

C. $0.116mm$

D. $0.367mm$

Answer: B

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26. Two copper wire of length l and 2l have radii, r and 2r respectively. What si the ratio of their specific resistance.?

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:3$

Answer: C

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27. Which circuit diagram shows voltmeter V and ammeter A correctly positioned to measure the total potential difference of the circuit and the current through each resistor?

A.

B.

C.

D.

Answer: A

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28. The electric field E, current density j and conductivity σ of a conductor are related as

A. $\sigma = E/J$

B. $\sigma = J/E$

C. $\sigma = J^2 E$

D. $\sigma = \frac{1}{JE}$

Answer: B

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29. Which of the following arrangements is correct on the basis of conductivity of materials?

A. Silver > copper > aluminium > tungsten

B. Silver > aluminium > copper > tungsten

C. Copper > silver > tungsten > aluminium

D. Silver $>$ tungsten $>$ copper $>$ aluminium

Answer: A

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30. The current density varies radical distance r as $J = ar^2$, in a cylindrical wire of radius R. The current passing through the wire between radical distance $R/3$ and $R/2$ is,

A. $\dfrac{65\pi aR^4}{2592}$

B. $\dfrac{25\pi aR^4}{72}$

C. $\dfrac{65\pi a^2R^3}{2938}$

D. $\dfrac{81\pi a^2R^4}{144}$

Answer: A

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31. Which of the following materials is the best conductor of electricity ?

A. Platinum

B. Gold

C. Silicon

D. Copper

Answer: D

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32. For which of the following depndences of drift velocity, v_d on electric field E, Ohm's law obeyed?

A. $v_d \propto E$

B. $v_d \propto E^2$

C. $v_d \propto \sqrt{E}$

D. $v_d \propto \dfrac{1}{E}$

Answer: A

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33. Current is flowing with a current density $J = 480 Acm^{-2}$ in a copper wire. Assuming that each copper atom contributes one free electron and given that

Avogadro number = 6.0×10^{23} atoms/mole

Density of copper = $9.0 g / cm^3$

Atomic weight of copper = 64 g/mole

Electronic charge $= 1.6 \times 10^{-19}$ coulomb

The drift velocity of electrons is

A. 1 mm/s

B. 2 mm/s

C. 0.5 mm/s

D. 0.36 mm/s

Answer: D

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34. The V-I graph for a conductor at temperature T_1 and T_2 are as shown in the figure. The term $(T_2 - T_1)$ is proportional to

A. $\cos 2\theta$

B. $\sin 2\theta$

C. $\cot 2\theta$

D. $\tan 2\theta$

Answer: C

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35. The temperature coefficient of resistance for a wire is $0.00125^\circ C^{-1}$. At 300 K its resistance is 1Ω. The temperature at which the resistance becomes 2Ω is

A. 450 K

B. 1127 K

C. 454 K

D. 900 K

Answer: B

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36. The resistance of the wire in the platinum resistance thermometer at ice point is 5Ω and at steam point is 5.25Ω. When the thermometer is inserted in an unknown hot bath its resistance is found to be 5.5Ω. The temperature of the hot bath is

A. $100^{\circ} C$

B. $200^{\circ} C$

C. $300^{\circ} C$

D. $350^{\circ} C$

Answer: B

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37. Find the true statement.

A. Ohm's law is applicable to all conductors of electricity

B. In an electrolyte solution, the electric current is mainly due to the movement of electrons

C. Specific resistance of a wire depends upon its dimension

D. The resistance of carbon decreases with the increase of temperature

Answer: D

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38. The graph between resistivity and temperature, for a limited range of temperature, is a straight line for a material like

A. copper

B. nichrome

C. silicon

D. mercury

Answer: B

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39. On increasing the temperature of a conductor, its resistance increases because

A. relaxation time increases

B. electron density decreases

C. relaxation time decreases

D. relaxation time remains constant

Answer: C

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40. The voltage V and current I graphs for a conductor at two different temperature T_1 and T_2 are shown in the figure. The relation between T_1 and T_2 is

A. $T_1 > T_2$

B. $T_1 < T_2$

C. $T_1 = T_2$

D. $T_1 = \dfrac{1}{T_2}$

Answer: A

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41. Fractional increase in resistivity per unit increase in temperature is defined as

A. resistivity

B. temperature coefficient of resistivity

C. conductivity

D. drift velocity

Answer: B

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42. The resistance of a wire at $20^\circ C$ is 20Ω and at $500^\circ C$ is 60Ω. At which temperature its resistance will be 25Ω?

A. $160^\circ C$

B. $250^\circ C$

C. $100^\circ C$

D. $80^\circ C$

Answer: D

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43. Nichrome or Manganin is widely used in wire bound standard resistors because of their

A. temperature independent resistivity

B. very weakly temperature dependent resistivity

C. strong dependence of resistivity with temperature

D. mechanical strength

Answer: B

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44. The tolerance level of a resistor with the colour code red, blue, orange, gold is

A. $\pm 5\%$

B. $\pm 10\%$

C. $\pm 20\%$

D. $\pm 30\%$

Answer: A

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45. What is the colour code for a resistor of resistance $3.5k\Omega$ with 5% tolerance ?

A. orange, green, orange and gold

B. orange, green, orange and silver

C. orange, green, red and silver

D. orange, green, red and gold

Answer: D

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46. A resistor is marked with the rings coloured brown, balck, green, and gold. The resitance in ohm is

A. $1 \times 10^6 \pm 10\,\%$

B. $1 \times 10^7 \pm 5\,\%$

C. $1 \times 10^6 \pm 5\,\%$

D. $1 \times 10^5 \pm 5\,\%$

Answer: C

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47. Pick out the wrong feature about carbon resistors.

A. Compact

B. Inexpensive

C. Relatively sensitive to temperature

D. Colour codes express their resistance values

Answer: C

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48. Two wires of same metal have the same length but their cross- sections are in the ratio 3 :1 . They are joined in series. The resistance of the thicker wire is 10Ω . The total resistance of the combination will be

A. $(5/2)\Omega$

B. $(40/3)\Omega$

C. 40Ω

D. 100Ω

Answer: C

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49. In the two circuits shown in the figure

A. $R_{AB} = R_{CD} = (\sqrt{3} + 2)\Omega$

B. $R_{AB} = (\sqrt{3} + 1)\Omega$

C. $R_{CD} = (\sqrt{5} + 1)\Omega$

D. $R_{AB} > R_{CD}$

Answer: D

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50. What is the equivalent resistance of the network shown in figure?

A. 8Ω

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

C. 4Ω

D. $\frac{16}{5}\Omega$

Answer: B

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51. Eight resistance each of 4 ohm are connected in the circuit as shown in figure. The equivalent resistance between A and B is

A. $\frac{8}{3}\Omega$

B. $\frac{32}{3}\Omega$

C. $\frac{32}{15}\Omega$

D. $\frac{32}{11}\Omega$

Answer: C

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52. In the circuit shown in figure, the total current supplied by the battery is

A. $1A$

B. $2A$

C. $3A$

D. $6A$

Answer: C

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53. The reading of ammeter shown in figure is

A. 6.56 A

B. 3.28 A

C. 2.18 A

D. 1.09 A

Answer: C

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54. Two resistances R_1 and R_2 provides series to parallel equivalents as n/1, then the correct relationship is

A. $\left(\frac{R_1}{R_2}\right)^{3/2}+\left(\frac{R_2}{R_1}\right)^{3/2}=n^{3/2}$

B. $\left(\frac{R_1}{R_2}\right)^3 + \left(\frac{R_2}{R_1}\right)^3 = n^3$

C. $\left(\frac{R_1}{R_2}\right)^2 + \left(\frac{R_2}{R_1}\right)^2 = n^2$

D. $\left(\frac{R_1}{R_2}\right)^{1/2} + \left(\frac{R_2}{R_1}\right)^{1/2} = n^{1/2}$

Answer: D

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55. Five equal resistances each of value R are connected to form a network as shown in figure. The equivalent resistance of the network between the points A and B is

A. $\dfrac{1}{2}R$

B. $2R$

C. $\dfrac{5}{8}R$

D. $\dfrac{8}{5}R$

Answer: C

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56. A and B are two points on a uniform ring of resistance R the $\angle ASCB = \theta$, whre C is the centre of the sign. The equivalent reisrtance between A and b

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

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

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

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

Answer: D

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57. The given figure shows a network of resistance. The effective resistance between points A and B of network is

A. $(3/2)\Omega$

B. 6Ω

C. 3Ω

D. 2Ω

Answer: D

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58. An electric of $5A$ is passing through a circuit contaning three arrengement in parallel if the length and radius of the wires are in the ratio $2:3:4$ and $3:4:5$ then the ratio of current passing through wires should be

A. $3:6:10$

B. $4 : 9 : 16$

C. $9 : 16 : 25$

D. $54 : 64 : 75$

Answer: D

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59. For the circuit shown in the figure, the current in the 4Ω resistor is

A. $0.5A$

B. $0.25A$

C. $1A$

D. $1.5A$

Answer: B

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60. Fourteen identical resistors each of resistance R are connected as shown in the figure. The equivalent resistance between the points A and B is

A. R

B. $14R$

C. $\frac{R}{14}$

D. $1.2R$

Answer: D

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61. In the circuit shown in figure, the potential difference across 3Ω is

A. 2 V

B. 4 V

C. 8 V

D. 16 V

Answer: A

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62. What is the potential difference between the points A and B in the circuit diagram shown in figure?

A. $\frac{20}{3}$ volt

B. $\frac{10}{3}$ volt

C. $\frac{20}{\sqrt{3}}$ volt

D. $\frac{10}{\sqrt{3}}$ volt

Answer: A

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63. A uniform wire of resistance 36 ohm is bent in the form of a circle. The effective resistance across the points A and B is

A. 5Ω

B. 15Ω

C. 7.2Ω

D. 30Ω

Answer: A

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64. Three unequal resistor in parallel are equivalent to a resistance 1Ω If two of them are in the ratio 1:2 and if no resistance value is fractional the largest of the three resistance in ohm is

A. 4

B. 6

C. 5

D. 12

Answer: B

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65. In the figure, find the resistance between points A and B. Both the circle and the diameter are made of uniform wire of resistance 1×10^{-4} ohm per metre. The length AB is 2 metre.

A. $(2/3) \times 10^{-4}\Omega$

B. $2\pi \times 10^{-4}\Omega$

C. $14.56 \times 10^{-4}\Omega$

D. $0.88 \times 10^{-4}\Omega$

Answer: D

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66.

In the circuit shown, the current through the 4Ω resistor is 1 amp when the points P and M are connected to a d.c. voltage source. The potential difference between the points M and N is

A. 0.5 volt

B. 3.2 volt

C. 1.5 volt

D. 1.0 volt

Answer: B

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67. In the network shown below, the ring has zero resistance. The equivalent resistance between the points A and B is

A. 2R

B. 4R

C. 7R

D. 10R

Answer: A

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68. Three resistors are connected to form the sides of a triangle ABC , the resistance of the sides AB, BC and CA are 40 ohms , 60 ohms and 100 ohms respectively. The effective resistance between the points A and B in ohms will be

A. 32

B. 64

C. 50

D. 200

Answer: A

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69. In the given circuit the voltmeter records 5 V. The resistance of the voltmeter in ohm is

A. 200

B. 100

C. 10

D. 50

Answer: B

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70. 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 and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then

A. $V_3 > V_2 > V_1$

B. $V_2 > V_1 > V_3$

C. $V_3 > V_1 > V_2$

D. $V_1 > V_2 > V_3$

Answer: B

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71. Resistors each of value 1Ω are arranged as shown in the figure. The equivalent resistance between points A and B is

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

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

C. $\frac{5}{4}\Omega$

D. $\frac{4}{5}\Omega$

Answer: A

72. A potential difference of 220 V is maintained across a 12000 ohm rheostat AB as shown in figure. The voltmeter V has a resistance of 6000 ohm and point C is at one fourth of the distance from A to B. What is the reading in the voltmeter?

A. 32 V

B. 36 V

C. 40 V

D. 42 V

Answer: C

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73. Find the reading of ammeter in the given circuit?

A. $3A$

B. $4A$

C. $1.5A$

D. $6A$

Answer: A

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74. In the circuit shown in the given figure, the resistance $R_1 R_2$ are respectively

A. 14Ω and 40Ω

B. 40Ω and 14Ω

C. 40Ω and 30Ω

D. 14Ω and 30Ω

Answer: A

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75. A letter A is constructed as a uniform wire of resistance 1 ohm/cm. The sides of the letter are 20 cm long and the cross piece in the middle is 10 cm long while the vertex angle is

60° the resistance of the letter between the two ends of the legs is

A. 50.0Ω

B. 26.7Ω

C. 2.72Ω

D. 34.0Ω

Answer: B

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76. Two wires of same radius having lengths l_1 and l_2 and resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity will be

A. $\dfrac{\rho_1 l_2 + \rho_2 l_1}{\rho_1 + \rho_2}$

B. $\dfrac{\rho_1 l_1 + \rho_2 l_2}{l_1 + l_2}$

C. $\dfrac{\rho_1 l_1 + \rho_2 l_2}{l_1 - l_2}$

D. $\dfrac{\rho_1 l_2 + \rho_2 l_1}{l_1 + l_2}$

Answer: B

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77. You have been provided with four 400 ohm resistors each. The number of ways in which these can be combined to have different equivalent resistances is

A. seven different combinations and seven different equivalent resistances

B. eight different combinations and seven different equivalent resistances

C. nine different combinations and eight different equivalent resistances

D. ten different combinations and nine different equivalent resistances

Answer: D

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78. Seven resistances ech of 20Ω are connected with 2 V battery as shown in figure.

The reading of ammeter will be

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

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

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

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

Answer: C

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79. Two conductors have the same resistance at $0^\circ C$ but their temperature coefficient of resistanc are α_1 and α_2. The respective temperature coefficients of their series and parallel combinations are nearly

A. $\alpha_1 + \alpha_2$

B. $\dfrac{\alpha_1 + \alpha_2}{2}$

C. $\alpha_1 - \alpha_2$

D. $\dfrac{\alpha_1 - \alpha_2}{2}$

Answer: B

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80. In the circuit shown, the value of

A. $R = 15\Omega$

B. $R = 30\Omega$

C. $\varepsilon = 36V$

D. $\varepsilon = 180V$

Answer: D

81. Thirteen resistances each of resistance $R\omega$ are connected in the circuit as shown in the figure. The effective resistance between A and B is

A. $2R\Omega$

B. $\frac{4}{3}R\Omega$

C. $\frac{2}{3}R\Omega$

D. $R\Omega$

Answer: C

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82. In the circuit shown, when R is removed an additional resistance of 72Ω must be introduced in series with the battery in order to keep the current through 30Ω resistance unaltered. Hence R is

A. 15Ω

B. 18Ω

C. 20Ω

D. 21Ω

Answer: C

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83. In the circuit shown, the internal resistance of the cell is negligible. The steady state current in the 2Ω resistor is

A. $0.6A$

B. $0.9A$

C. $1.2A$

D. $1.5A$

Answer: B

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84. A copper wire and an iron wire, each having an area of corss-section A and lengths L_1 and L_2 are joined end to end. The copper end is maintained at a potential V_1 and the iron end at a lower potential V_2. If σ_1 and σ_2 are the conductivities of copper and iron respectively, the potential of the junction will be

A. $\dfrac{\sigma_1 V_1 + \sigma_2 V_2}{\dfrac{\sigma_1}{L_1} + \dfrac{\sigma_2}{L_2}}$

B. $\dfrac{\dfrac{\sigma_1 V_1}{L_1} + \dfrac{\sigma_2 V_2}{L_2}}{\dfrac{\sigma_1}{L_1} + \dfrac{\sigma_2}{L_2}}$

C. $\dfrac{\dfrac{\sigma_1}{L_1} + \dfrac{\sigma_2}{L_2}}{\sigma_1 V_1 + \sigma_2 V_2}$

D. $\dfrac{\sigma_1 V_1 - \sigma_2 V_2}{\dfrac{\sigma_1}{L_1} - \dfrac{\sigma_2}{L_2}}$

Answer: B

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85. The resultant resitance of the circuit between A and B is

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

B. $\frac{3R}{2}$

C. $2R$

D. R

Answer: A

86. In the circuit shown below, the current that flows a to b when the switch S is closed is

A. $-1.5A$

B. $+1.5A$

C. $+1.0A$

D. $-1.0A$

Answer: D

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87. In the circuit shown below each resistance is R. The current I is

A. $\dfrac{15V_0}{7R}$

B. $\dfrac{7V_0}{15R}$

C. $\dfrac{7V_0}{R}$

D. $\dfrac{15V_0}{R}$

Answer: A

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

A. R

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

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

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

Answer: C

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89. In the circuit shown, the current through 8 ohm is same before and after connecting ε. The value of ε is

A. 12 V

B. 6 V

C. 4 V

D. 8 V

Answer: C

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90. Two resistors of resistances $200k\Omega$ and $1M\omega$ respectively form a potential divider with outer junctions maintained at potentials of $+3V$ and $-15V$

. Then, the potential at the junction between the resistors is

A. $0V$

B. $+1V$

C. $-12V$

D. $+12V$

Answer: A

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91. Three resistance $5\Omega, 5\Omega$ and 6Ω are connected as shown in figure. If the point S divides the resistance 6Ω into two equal halves, the resistance between points P and S is

A. 11Ω

B. 8Ω

C. 6Ω

D. 4Ω

Answer: D

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92. A number of 24Ω resistors are connected as shown in the figure. Then the effective resistance between P and Q is

A. 21.6Ω

B. 24.8Ω

C. 26Ω

D. 36Ω

Answer: B

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93. The effective resistance across the points A and I is

A. 2Ω

B. 1Ω

C. 0.5Ω

D. 5Ω

Answer: B

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94. In the circuit shown in the figure, the current through 3Ω resistance is

A. $0.5A$

B. $0.7A$

C. $1.0A$

D. $1.2A$

Answer: C

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95. In the circuit shown, the current I_1 and I_2 are

A. $I_1 = 1.5A, I_2 = 0.5A$

B. $I_1 = 0.5A, I_2 = 1.5A$

C. $I_1 = 1A, I_2 = 3A$

D. $I_1 = 3A, I_2 = 1A$

Answer: B

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96. The reading on the ammeter in the following figure will be

A. $0.8A$

B. $0.6A$

C. $0.4A$

D. $0.2A$

Answer: C

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97. The resistance across A and B in the figure below will be

A. $3R$

B. R

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

D. $2R$

Answer: C

View Text Solution

98. The potential difference between A and B as shown in the given figure is

A. $1V$

B. $2V$

C. $3V$

D. $4V$

Answer: A

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99. The equivalent resistance between points A and B with switch S open and closed are respectively

A. $4\Omega, 8\Omega$

B. $8\Omega, 4\Omega$

C. $6\Omega, 9\Omega$

D. $9\Omega, 6\Omega$

Answer: B

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100. How many minimum number of 2Ω resistance can be connected to have an effective resistance of 1.5Ω

A. 3

B. 2

C. 6

D. 4

Answer: C

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101. A battery of emf, 10 V is connected to resistances as shown in figure. The potential difference $V_A - V_B$ between the points A and B is

A. $-2V$

B. $\left(\frac{20}{11}\right)V$

C. $2V$

D. $5V$

Answer: C

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102. In the given circuit the equivalent resistance between the points A and B is

A. 9Ω

B. 11.6Ω

C. 14.5Ω

D. 21.2Ω

Answer: B

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103. If the ammeter in the given circuit reads 2 A, the resistance R is

A. 1Ω

B. 2Ω

C. 3Ω

D. 4Ω

Answer: A

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104. What current will flow through the $2k\Omega$ resistor in the circuit shown in the figure?

A. 3 mA

B. 6 mA

C. 12 mA

D. 36 mA

Answer: A

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105. Figure shows a network of eight resistors, each equal to 2Ω, connected to a 3 V battery of negligible internal resistance. The current I in the circuit is

A. 0.25 A

B. 0.50 A

C. 0.75 A

D. 1.0 A

Answer: D

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106. The equivalent resistance between the terminals A and D in the following circuit is

A. 10Ω

B. 20Ω

C. 5Ω

D. 30Ω

Answer: B

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107. A metallic wire of resistance 12Ω is bent of form a square. The resistance between two diagonal points would be

A. 12Ω

B. 24Ω

C. 6Ω

D. 3Ω

Answer: D

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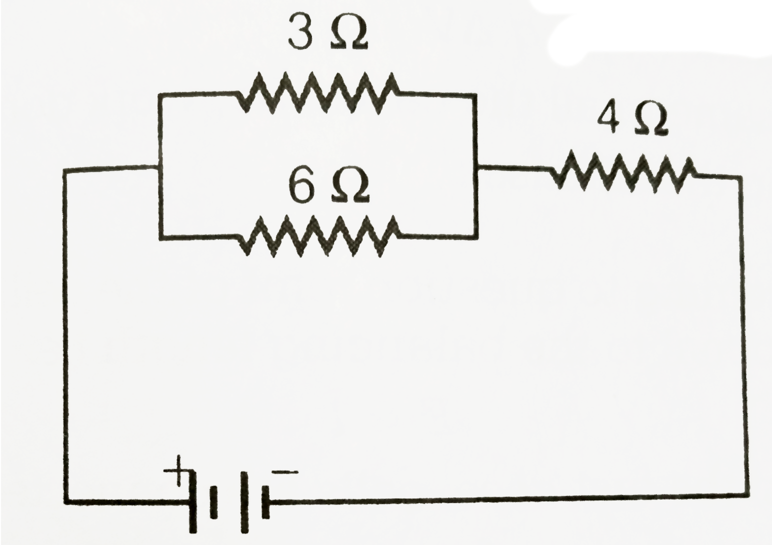
108. Current through 3Ω resistor is 0.8A, then potential drop through 4Ω resistor is



A. 9.6 V

B. 2.6 V

C. 4.8 V

D. 1.2 V

Answer: C

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109. Three equal resistances each of 3Ω are in series and connected to a cell of internal resistance one ohm. If these resistance are in parallel and connected to the same cell, then the ratio of the respective currents through the electric circuits in the two cases is

A. $1/8$

B. $1/7$

C. $1/5$

D. $1/3$

Answer: C

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110. The emf of the battery ε in the circuit shown in figure is 15 volt and internal resistance is 0.5 ohm. What is the current drawn from the battery?

A. $1A$

B. $2A$

C. $3A$

D. $4A$

Answer: A

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111. The emf of a cell is ε and its internal resistance is r. its terminals are connected to a resistance R. The potential difference between the terminals is $1.6V$ for $R = 4\Omega$, and $1.8V$ for $R = 9\Omega$. Then,

A. $\varepsilon = 1V, r = 1\Omega$

B. $\varepsilon = 2V, r = 1\Omega$

C. $\varepsilon = 2V, r = 2\Omega$

D. $\varepsilon = 2.5V, r = 0.5\Omega$

Answer: B

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112. When a current of 2 A flows in a battery from negative to positive terminal, the potential difference across it is 12 V. If a current of 3 A flowing in the opposite direction produces a potential difference of 15 V, the emf of the battery is

A. 12.6 V

B. 13.2 V

C. 13.5 V

D. 14.0 V

Answer: B

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113. A battery of emf ε and internal resistance r is connected to the circuit as shown in the figure. When the key K_1 is closed and K_2 is open, the ideal voltmeter shows a reading of 18 V. When kcy K_2 is closed and K_1 is open, the voltmeter reading is 24 V. When K_1 and K_2 are both open, the voltmeter reading is

A. 8 V

B. 12 V

C. 24 V

D. 36 V

Answer: D

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114. A battery of emf E has an internal resistance r. A variable resistacne R is connected to the terminals of the battery. A current i is drawn from the battery. V is the terminal potential difference. If R alone is gradually reduced to zero, which of the following best describes i and V?

A. I approaches zero, V approaches ε

B. I approaches ε / r, V approaches zero

C. I approaches ε / r, V approaches ε

D. I approaches infinity, V approaches ε

Answer: B

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115. A battery of emf ε and internal resistance r sends currents I_1 and I_2, when connected to external resistance R_1 and R_2 respectively. Find the emf and internal resistance of the battery.

A. $\dfrac{I_1R_2 - I_2R_1}{I_2 - I_1}$

B. $\dfrac{I_1R_2 + I_2R_1}{I_1 - I_2}$

C. $\dfrac{I_1R_1 + I_2R_2}{I_1 - I_2}$

D. $\dfrac{I_1R_1 - I_2R_2}{I_2 - I_1}$

Answer: D

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116. 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. 10 V

B. 5 V

C. 3 V

D. 2 V

Answer: A

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117. A battery of emf 8 V with internal resistance 0.5Ω is being charged by a 120 V dc supply using a series resistance of 15.5Ω. The terminal voltage of the battery is

A. 20.5 V

B. 15.5 V

C. 11.5 V

D. 2.5 V

Answer: C

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118. In the given figure, the internal resistance of the cell is

A. 2Ω

B. 2.5Ω

C. 1Ω

D. 1.5Ω

Answer: B

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119. A student measures the terminal potential difference (V) of a cell (of emf ε and internal resistance r) as a function of the current (I) flowing through it. The slope and intercept of the graph between V and I, then respectively, equal

A. $-r \text{ and } \varepsilon$

B. $r \text{ and } -\varepsilon$

C. $-\varepsilon \text{ and } r$

D. ε and $-r$

Answer: A

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120. The number of dry cells, each of e.m.f. 1.5 volt and internal resistance 0.5ω that must be joined in series with a resistance of 20 ohm so as to send a current of 0.6 ampere through the circuit is -

A. 2

B. 8

C. 10

D. 12

Answer: C

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121. A group of N cells whose emf varies directly with the internal resistance as per the equation $\varepsilon_N = 1.5 r_N$ are connected as shown in the figure. The current I in the circuit is

A. 0.51 A

B. 5.1 A

C. 0.15 A

D. 1.5 A

Answer: D

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122. 32 cells each of emf $3V$ are connected in series. The combination as shown andthe total emf is $84V$ How many number of cells are connected reversely?

A. 0

B. 2

C. 4

D. 8

Answer: B

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123. n identical cells, each of emf ε and internal resistance r, are joined in series to from a closed circuit. One cell a is joined with reversed polarity. The potential difference across each cell, except A, is

A. $\frac{2n\varepsilon}{n-2}$

B. $\frac{(n-2)\varepsilon}{n}$

C. $\frac{(n-1)\varepsilon}{n}$

D. $\frac{2\varepsilon}{n}$

Answer: D

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124. Three similar cells, each of emf 2 V and internal resistance $r\Omega$ send the same current through an external resistance of 2Ω, when connected in series or in parallel. The strength of the current flowing through the external resistance is

A. $1A$

B. $1.5A$

C. $2A$

D. $0.75A$

Answer: D

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125. What is the potential drop between points A and C in the following circuit? Resistances 1Ω and 2Ω represent the internal resistances of the respective cells.

A. 1.75 V

B. 2.25 V

C. $\frac{5}{4}V$

D. $\frac{4}{5}V$

Answer: B

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126. Two batteries of emfs 2 V and 1 V of internal resistances 1Ω and 2Ω respectively are connected in parallel. The effective emf of the combination is

A. $\frac{3}{2}V$

B. $\frac{5}{3}V$

C. $\frac{3}{5}V$

D. $2V$

Answer: B

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127. n equal cell having emf E and internal resistance r, are connected in series circuit of a resistance R. Same current flows in circuit either they connected in series or parallel, if:

A. $R = nr$

B. $R = r$

C. $r = nR$

D. $R = \sqrt{n}r$

Answer: B

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128. 4 cells each of emf 2 V and internal resistance of 1Ω are connected in parallel to a load resistor of 2Ω. Then the current through the load resistor is

A. $2A$

B. $1.5A$

C. $1A$

D. $0.888A$

Answer: D

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129. Four cells of identical emf ε and internal resistance r are connected in series to a variable resistor. The following graph shows the variation of terminal voltage of the combination with current. The emf of each cell used is

A. 1.4 V

B. 5.6 V

C. 2 V

D. 1 V

Answer: A

130. A galvanometer connected with an unknown resistor and two identical cells in series each of emf 2 V shows a current of 1 A. If the cells are connected in parallel, it shows 0.8 A. Then the internal resistance of the cell is

A. 1Ω

B. 0.5Ω

C. 0.25Ω

D. 0.33Ω

Answer: A

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131. Eels are able to generate current with biological cells celled electroplaques. The electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of fish containing 5000 electroplaques. The arrangement is suggestively shown in the figure. Each electroplaque has an emf of 0.15 V and internal resistance of 0.25Ω. The water surrounding the eel completes a circuit between the head and its tail. If the water surrounding it has a resistance of 500Ω, the current, an eel can produce in water is about

A. 1.5 A

B. 3.0 A

C. 15 A

D. 30 A

Answer: A

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132. In the given circuit voltage across resistance R_4 is

A. 0.4 V

B. 0.6 V

C. 0.8 V

D. 1.0 V

Answer: A

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

A. $-3A$

B. $3A$

C. $13A$

D. $23A$

Answer: D

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134. A current of 6 A enters one corner P of an equilateral triangle PQR having 3 wires of resistances 2Ω each and leaves by the corner R. Then the currents I_1 and I_2 are

A. 2 A, 4 A

B. 4 A, 2 A

C. 1 A, 2 A

D. 2 A, 3 A

Answer: A

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135. Figure shows currents in a part of an electric circuit, then current I is

A. 1.7 A

B. 3.7 A

C. 1.3 A

D. $1A$

Answer: A

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136. In the circuit shown, current flowing through 25 V cell is

A. 7.2 A

B. $10A$

C. $12A$

D. $14.2A$

Answer: C

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137. For what value of R will the current in galvanometer be zero?

A. 1Ω

B. 2Ω

C. 5Ω

D. 7Ω

Answer: D

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138. In the circuit as shown in the figure, current flowing through 20Ω resistor is

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

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

C. $1A$

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

Answer: A

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139. The equivalent resistance between X and Y in the circuit shows is

A. 10Ω

B. 5Ω

C. 7Ω

D. 14Ω

Answer: C

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140. In the following network of 5 branches, the respective currents are I_1, I_2, I_3 etc. Given that $I_1 = -0.5A, I_4 = 1A$ and $I_5 = 0.5A,$

the remaining currents are

A. $I_2 = -1.5A, I_3 = 0.5A, I_6 = 0.5A$

B. $I_2 = 1.5A, I_3 = -0.5A, I_6 = 0.5A$

C. $I_2 = 1.5A, I_3 = 0.5A, I_6 = -0.5A$

D. $I_2 = 1.5A, I_3 = 0.5A, I_6 = 0.5A$

Answer: B

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141. A circuit is as shown in the figure. Then, the current from A to B is

A. $+500mA$

B. $+250mA$

C. $-250mA$

D. $-500mA$

Answer: B

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142. When the switch S is closed in the circuit shown in figure, the current passing through it is

A. $7.5A$

B. $3.0A$

C. $4.5A$

D. $6.5A$

Answer: C

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143. In the circuit shown, the current through the 5Ω resistor is

A. $\frac{8}{3}A$

B. $\frac{9}{13}A$

C. $\frac{4}{13}A$

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

Answer: D

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144. In the part of a circuit shown in figure, the potential difference between points G and H $(V_G - V_H)$ will be

A. 0 V

B. 12 V

C. 7 V

D. 3 V

Answer: C

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145. In the Wheatstone's network as shown in the figure, $P = 10\Omega, Q = 20\Omega, R = 15\Omega, S = 30\Omega$ The current passing through the battery of negligible resistance is

A. $0.36A$

B. $0A$

C. $0.18A$

D. $0.72A$

Answer: A

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146. In the Wheatstone bridge as shown in the figure, in order to balance the bridge, we must have

A. $R_1 = 3\Omega, R_2 = 3\Omega$

B. $R_1 = 6\Omega, R_2 = 15\Omega$

C. $R_1 = 1.5\Omega R_2$ = any finite value

D. $R_1 = 3\Omega, R_2$ = any finite value

Answer: D

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147. Four resistors are connected as shown in the figure. A 6 V battery of negligible resistance is connected across terminals A and

C. The potential difference across terminals B and D will be

A. 0 V

B. 1.5 V

C. 2 V

D. 3 V

Answer: A

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148. In a Wheatstone's network, $P = 2\Omega, Q = 2\Omega, R = 2\Omega$ and $S = 3\Omega$. The resistance with which S is to be shunted in order that the bridge may be balanced is

A. 1Ω

B. 2Ω

C. 4Ω

D. 6Ω

Answer: D

149. Consider the following statements regarding the network shown in the figure.

(1) The equivalent resistance of the network between points A and B is independent of value of G.

(2) The equivalent resistance of the network between points A and B is $\frac{4}{3}R$

(3) The current through G is zero.

Which of the given statements is/are true?

A. (1) alone

B. (2) alone

C. (2) and (3)

D. (1), (2) and (3)

Answer: D

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150. Five equal resistances, each of resistance R, are connected as shown in figure. A battery of V volt is connecte between A and B. The current flowing in FC will be

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

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

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

D. $\frac{2V}{R}$

Answer: C

151. What is the resistance between the points X and Y of the circuit in the figure? Assume that the resistance of each resistor is 25 ohm.

A. 100 ohm

B. 50 ohm

C. 25 ohm

D. 75 ohm

Answer: C

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152. The resistance in the four arms of a Wheatstone network in cyclic order are $5\Omega, 2\Omega, 6\Omega$ and 15Ω. If a current of 2.8 A enters the junction of 5Ω and 15Ω, then the current through 2Ω resistor is

A. 1.5 A

B. 2.8 A

C. 0.7 A

D. 2.1 A

Answer: D

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

A. 20Ω

B. 5Ω

C. $\frac{25}{3}\Omega$

D. 10Ω

Answer: B

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154. The resistance to be connected in parallel with 12Ω resistance in the circuit so that potential difference between B and D is zero is

A. 6Ω

B. 4Ω

C. 12Ω

D. 3Ω

Answer: B

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155. In the circuit, the value of I is

A. $0.10A$

B. $0.20A$

C. $0.40A$

D. $0.60A$

Answer: D

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156. Two resistances are connected in two gaps of a metre bridge. The balance point is 20cm from the zero end. A resistance of 15Ω is connected in series with the smaller of the two. The null point shifts to 40cm. Then value of the smaller resistance Is:

A. 3

B. 6

C. 9

D. 12

Answer: C

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157. In the shown arrangement of the experiment of the metre bridge if AC corresponding to null deflection of galvanometer is x, what will be its value if the radius of the wire AB is doubled?

A. $x / 2$

B. $x / 4$

C. $4x$

D. x

Answer: D

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158. With two resistance R_1 and $R_2(> R_1)$ in the two gaps of a metre bridge the balance was found to be 1/3 m from the zero end. When a 6Ωresistance is connected in series with the smaller of the two resistance, the point is shifted to 2/3 m from the same end, then R_1 and R_2 are

A. 4, 2

B. 2, 4

C. both (a) and (b)

D. neither (a) nor (b)

Answer: B

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159. A resistance of 2Ω is connected across one gap of a metre-bridge(the length of the wire is 100 cm) and an unknown resistance, greater than 2Ω, is connected across the other gap. When these resistances are interchanged, the balance points shifts by 20 cm. Neglecting any corrections, the unknown resistance is

A. 3Ω

B. 4Ω

C. 5Ω

D. 6Ω

Answer: A

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160. In a metre bridge experiment, resistance are connected as shown in the figure. The balancing length l_1 is 55 cm. Now an unknown resistance x is connected in series with P and the new balancing length is found to be 75 cm. The value of x is

A. $\frac{54}{13}\Omega$

B. $\frac{20}{11}\Omega$

C. $\frac{48}{11}\Omega$

D. $\frac{11}{48}\Omega$

Answer: C

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161. Show that the percentage error in the measurement of resistance by a metre bridge is minimum when the null point is near about the centre of the wire.

A. 0 cm

B. 20 cm

C. 50 cm

D. 100 cm

Answer: C

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162. A potentiometer wire of length 200 cm has a resistance of 20Ω. It is connected in series with a resistance of 10Ω and an accumulator of emf 6 V having negligible internal resistance. A source of 2.4 V is balanced against a length L of the potentiometer wire. The value of L is

A. 100 cm

B. 120 cm

C. 110 cm

D. 140 cm

Answer: B

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163. A potentiometer wire of length 100 cm has a resistance of 100Ω it is connected in series with a resistance and a battery of emf 2 V and of negligible internal resistance. A source of emf 10 mV is balanced against a length of 40 cm of the potentiometer wire. what is the value of the external resistance?

A. 790Ω

B. 890Ω

C. 990Ω

D. 1090Ω

Answer: A

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164. The potential gradient long the length of a unifrom wire is $10 \mathrm{volt} / meter$. B and C are the two points at $30 cm$ and $60 cm$ point on a meter scale fitted along the wire. The potential diffenence between B and C will be

A. 3 volt

B. 0.4 volt

C. 7 volt

D. 4 volt

Answer: A

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165. Figure shows a potentiometer using a cell C of emf 2 V and internal resistance 0.5Ω connected to a wire AB. A standard cell C_1 of a constant emf of $1.02V$ gives a balance point at 51 cm of the wire. When C_1 is replaced by a cell of emf , the balance point is obtained at 75 cm. What is the value of E?

A. 1.25 V

B. 1.5 V

C. 1.75 V

D. 2.0 V

Answer: B

166. A potentiometer wire 10 long has a resistance of 40Ω. It is connected in series with a resistances box and a 2 v storage cell. If the potential gradient along the wire is $0.01\frac{V}{m}$ the resistance unplugged in the box is

A. 260Ω

B. 760Ω

C. 960Ω

D. 1060Ω

Answer: B

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

A. 2Ω

B. 4Ω

C. 0.5Ω

D. 1Ω

Answer: A

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168. A potentiometer has uniform potential gradient. The specific resistance of the material of the potentiometer wire is 10^{-7} ohm-meter and the current passing through it is 0.1 ampere, cross-section of the wire is

$10^{-6}m^2$. The potential gradient along the potentiometer wire is

A. $10^{-4}V/m$

B. $10^{-6}V/m$

C. $10^{-2}V/m$

D. $10^{-8}V/m$

Answer: C

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169. In a potentiometer of 10 wires, the balance point is obtained on the 7^{th} wire. To shift the balance point to 9^{th} wire, we should

A. decrease resistance in the main circuit

B. increase resistance in the main circuit

C. decrease resistance in series with the cell whose emf is to be measured

D. increase resistance in series with the cell whose emf is to be determined

Answer: D

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170. In a potentionmeter experiment, when three cells A, B and C are connected in series, the balancing length is found to be 740 cm. If A and B are connected in series, balancing length is 440 cm and for B and C connected in series, it is 540 cm. The emf of E_A, E_B and E_C are respectively (in volts)

A. 1, 1.2 and 1.5

B. 1, 2 and 3

C. 1.5, 2 and 3

D. 1.5, 2.5 and 3.5

Answer: A

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171. A cell can be balanced against $110cm$ and $100cm$ of potentiometer wire, respectively with and without being short circuited through a resistance of 10Ω. Its internal resistance is

A. 2.0 ohm

B. zero

C. 1.0 ohm

D. 0.5 ohm

Answer: C

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172. The accurate measurement of emf can be obtained using.

A. multimeter

B. voltmeter

C. voltameter

D. potentiometer

Answer: D

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173. Two resistors whose value are in ratio $2:1$ are connected in parallel with one cell. Then ratio of power dissipated is

A. $2:1$

B. $4:1$

C. $1:2$

D. $1:1$

Answer: C

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174. Two bulbs of 500W and 300W are manufactured to operate on a 220V line.If their resis tance are R_1 and R_2 respectively then value of $\frac{R_1}{R_2}$ is

A. $5/3$

B. $3/5$

C. $25/9$

D. $9/25$

Answer: B

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175. Time taken by a 836 W heater to heat one litre of water from $10^{\circ}C \rightarrow 40^{\circ}C$ is

A. $50s$

B. $100s$

C. $150s$

D. $200s$

Answer: C

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176. 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 same supply. Power dissipation in this case is P_2. Then, $P_1 : P_2$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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177. Figure shows three resistors configurations R_1, R_2 and R_3 connected to 3 V battery. If the power dissipated by the configurations R_1, R_2 and R_3 is P_1, P_2 and P_3 respectively, then

A. $P_1 > P_2 > P_3$

B. $P_1 > P_3 > P_2$

C. $P_2 > P_1 > P_3$

D. $P_3 > P_2 > P_1$

Answer: C

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178. A current of 3 A flows through the 2Ω resistor shown in the circuit below. The power dissipated in the 5Ω resistor is

A. 1 W

B. 5 W

C. 4 W

D. 2 W

Answer: B

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179. n identical light bulbs, each designed to draw P power from a certain voltage supply , are joined in series across that supply. The total power which they will draw is

A. nP

B. P

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

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

Answer: C

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180. Consider a cylindrical element as shown in figure. Current flowing through the element is I and resistivity of material of the cylinder is ρ.

Choose the correct option out of the following.

A. Power loss in second half is four times the power loss in first half

B. Voltage drop in first half is twice of voltage drop in second half

C. Current density in both halves is equal

D. Electric field in both halves is equal

Answer: A

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181. An electric heating element consumes 500 W when connected to a 100 V line. If the line voltage becomes 150 V, the power consumed will be

A. 500 W

B. 750 W

C. 1000 W

D. 1125 W

Answer: D

Watch Video Solution

182. An electric kettle takes $4A$ current at $220V$. How much time will it take to boil $1kg$ of wate from temperature $20^\circ C$? The temperature of boiling water is $100^\circ C$

A. 12.6 min

B. 4.2 min

C. 6.3 min

D. 8.4 min

Answer: C

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183. Five equal resistors when connected in series dissipated 5 W power. If they are connected in paralle, the power dissipated will be

A. 25 W

B. 50 W

C. 100 W

D. 125 W

Answer: D

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184. The total power dissipated in watts in the circuit shown in figure is

A. 40

B. 54

C. 4

D. 16

Answer: B

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185. A source of emf having internal resistance of 6Ω dissipates maximum power in a circuit consisting of three resistors R_1, R_2 and R_3

as shown. Then

A. $V = 24V, I_3 = 0.8A$

B. $V = 6V, I_3 = 0.4A$

C. $V = 4V, I_3 = 0.8A$

D. $V = 24V, I_3 = 0.4A$

Answer: A

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

A.

B.

C.

D.

Answer: A

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187. Resistances P, Q, S and R are arranged in a cyclic order to form a balanced Wheatstone's bridge network. The ratio of power consumed in the branches $(P+Q)$ and $(R+S)$ is

A. $1:1$

B. $R:P$

C. $P^2:Q^2$

D. $P^2:R^2$

Answer: B

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188. An electric bulb rated for $500W$ at $100V$ is used in a circuit having a $200V$ supply. The reistance R that must be put in series with bulb, so that the bulb delivers 500W is ....Ω.

A. 10Ω

B. 15Ω

C. 20Ω

D. 25Ω

Answer: C

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189. A rise of temperature of $4^\circ C$ is observed in a conductor by passing a current. If the current is tripled, the rise of temperature will be

A. $8^\circ C$

B. $12^\circ C$

C. $16^\circ C$

D. $36^\circ C$

Answer: D

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190. Two electric bulbs marked 40 W, 220 V and 60 W, 220 V when connected in series, across same voltage supply of 220 V, the effective power is P_1 and when connected in parallel, the effective power is P_2. Then $\frac{P_1}{P_2}$ is

A. 0.5

B. 0.48

C. 0.24

D. 0.16

Answer: C

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191. Two lamps, one rated 40 W at 220 V and the other 100 W at 220 V, are connected in parallel to the electric supply at 220V.

(a) Draw a circuit diagram to show the connections.

(b) Calculate the current drawn from the electric supply.

(c) Calculate the total energy consumed by the two lamps together when they operate for one hour.

A. 25 W

B. 14 W

C. 60 W

D. 100 W

Answer: B

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192. Two identical cells each of emf ε, having negligible internal reistance r, are connercted in parallel with each other across an external resistance R. What is the current through this resistance.

A. $R = r / 2$

B. $R = r$

C. $R = r / 3$

D. $R = 2r$

Answer: A

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193. A battery of internal resistance 4Ω is connected to the network of resistance as shown in the figure.

In order to give the maximum power to the network, the value of R should be

A. $\frac{4}{9}\Omega$

B. $\frac{8}{9}\Omega$

C. $\frac{39}{7}\Omega$

D. $\frac{11}{7}\Omega$

Answer: C

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194. Masses fo three are in the ratio $1:3:5$ their lengths are in the ratio $5:3:1$ when they are connected in series to an external source, the amounts of heats produced in them are in the ratio

A. $5:9:5$

B. $25:9:1$

C. $125 : 15 : 1$

D. $25 : 15 : 9$

Answer: C

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195. An electric bulb marked as 50 W-200 V is connected across a 100 V supply. The present power of the bulb is

A. 37.5 W

B. 25 W

C. 12.5 W

D. 10 W

Answer: C

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196. Heat is produced at a rate given by H in a resistor when it is connected across a supply of voltage V. If now the resistance of the resistor is doubled and the supply voltage is made $V/3$ then the production of heat in the resistor will be

A. $\frac{H}{18}$

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

C. $6H$

D. $18H$

Answer: A

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197. Two electric bulbs marked 25W-220V and 100W-220V are connected in series to a 440 V supply. Which of the bulbs will fuse ?

A. 100 W

B. 25 W

C. neither

D. both

Answer: B

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198. A line having a total resistance of 0.2Ω delivers 10kW at 220V to a small factory. Calculate the efficiency of the transmission.

A. 0.65

B. 0.75

C. 0.85

D. 0.95

Answer: D

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199. Three electric bulbs of 200 W, 200 W and 400 W are shown in figure. The resultant power of the combination is

A. 800 W

B. 400 W

C. 200 W

D. 600 W

Answer: C

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1. In an atom electrons revolves around the nucleus along a path of radius 0.72Ã... making 9.4×10^{18} revolution per second. The equivalent current is $\left(e = 1.6 \times 10^{-19} C\right)$

A. 1.2 A

B. 1.5 A

C. 1.4 A

D. 1.8 A

Answer: B

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2. A battery of emf 15 V and internal resistance of 4Ω is connected to a resistor. If the current in the circuit is 2A and the circuit is closed. Resistance of the resistor and terminal voltage of the battery will be

A. $2.5\Omega, 6V$

B. $3.5\Omega, 6V$

C. $2.5\Omega, 7V$

D. $3.5\Omega, 7V$

Answer: D

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3. The resistance of the wire in the platinum resistance thermometer at ice point is 5Ω and at steam point is 5.25Ω. When the thermometer is inserted in an unknown hot bath its resistance is found to be 5.5Ω. The temperature of the hot bath is

A. $200^{\circ}C$

B. $80^{\circ}C$

C. $30^{\circ}C$

D. $85^{\circ}C$

Answer: B

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4. An electric heater is connected to the voltage supply. After few seconds Current gets its steady value then its initial current will be

A. equal to its steady current

B. slightly higher than its steady current

C. slightly less than its steady current

D. zero

Answer: A

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5. A cylindrical rod is reformed to half of its original length keeping volume constant. If its resistance before this change were R, then the resistance after reformation of rod will be

A. R

B. $\frac{R}{4}$

C. $\frac{3R}{4}$

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

Answer: B

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6. A copper wire iis stretched to make it $0.1\,\%$ longer. What is the percentage change in its resistance?

A. increase by 0.05%

B. increase by 0.2%

C. decrease by 0.2%

D. decrease by 0.05%

Answer: B

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7. When a current of 2 A flows in a battery from negative to positive terminal, the potential difference across it is 20 V. If a current of 3 A flowing in the opposite direction produces a potential difference of 25 V, the emf of the battery is

A. 20 V

B. 22 V

C. 15.5 V

D. 14 V

Answer: B

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8. Three resistances $2\Omega, 4\Omega, 5\Omega$ are combined in series and this combination is connected to a battery of 12 V emf and negligible internal resistance. The potential drop across these resistances are

A. (5.45, 4.36, 2.18)V

B. (2.18, 5.45, 4.36)V

C. (4.36, 2.18, 5.45)V

D. (2.18, 4.36, 5.45)V

Answer: D

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9. A copper cylindrical tube has inner radius a and outer radius b. The resistivity is p. The resistance of . the cylinder between the two ends is

A. $\dfrac{\rho l}{b^2 - a^2}$

B. $\dfrac{\rho l}{2\pi(b - a)}$

C. $\dfrac{\rho l}{\pi(b^2 - a^2)}$

D. $\dfrac{\pi\left(b^2 - a^2\right)}{\rho l}$

Answer: C

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10. If voltage across a bulb rated 220 V, 160 W drops by 3% of its rated value, the percentage of the rated value by which the power would decrease is

A. 0.2

B. 0.025

C. 0.06

D. 0.1

Answer: C

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11. n resistors each of resistance R first combine to give maximum effective resistgance and then combine to give minimum. The ratio of the maximum resistance is

A. n

B. n^2

C. $n^2 - 1$

D. n^3

Answer: B

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12. The resistivity of alloy manganin is

A. Nearly independent of temperature

B. Increase rapidly with increase in temperature

C. Decrease with increase in temperature

D. Increase rapidly with decrease in temperature

Answer: A

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13. A potentiometer wire of length 100 cm has a resistance of 100Ω it is connected in series with a resistance and a battery of emf 2 V and of negligible internal resistance. A source of emf 10 mV is balanced against a length of 40 cm of the potentiometer wire. what is the value of the external resistance?

A. 790Ω

B. 890Ω

C. 990Ω

D. 1090Ω

Answer: A

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14. A boy has two spare light bulbs in his drawer. One is market 220V and 100W and the other is market 240V and 60W. He tries to decide which of the following assertions are correct?

A. The 60 W light bulb has more resistance and therefore burns less brightly

B. The 60 W light bulb has less resistance and therefore burns less brightly

C. The 100 W bulb has more resistance and therefore burns more brightly

D. The 100 W bulb has less resistance and therefore buns less brightly

Answer: A

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15. In a potentiometer a cell of emf 1.5 V gives a balanced point at 32 cm length of the wire. If the cell is replaced by another cell then the balance point shifts to 65 cm. Then the emf of second cell is

A. 3.05 V

B. 2.05 V

C. 4.05 V

D. 6.05 V

Answer: A

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16. In a potentiometer the balancing with a cell is at length of 220cm. On shunting the cell with a resistance of 3Ω balance length becomes 130cm. What is the internal resistance of this cell.

A. 4.5Ω

B. 7.8Ω

C. 6.3Ω

D. 2.08Ω

Answer: D

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1. A potentiometer circuit is set up as shown. The potential gradient, across the potentiometer wire, is k volt/cm and the ammeter, present in the circuit, reads 1.0 A when two way key is swtiched off. The balance points, when the key between the terminals (i) 1 and 2 (ii)) 1 and 3, is plugged in, are found to be at lengths $l_1 cm$ and $l_2 cm$ respectively. The magnitudes, of the resistors R and X, in ohms, are equal, respectively, to

A. $k(l_2 - l_1)$ and kl_2

B. kl_1 and $k(l_2 - l_1)$

C. $k(l_2 - l_1)$ and kl_1

D. kl_1 and kl_2

Answer: B

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2. Consider the following two statement.

`(A) Kirchhoff's junction law follows from the conservation of charge.

(B) Krichhoff's loop law follows from the conservation of energy.

Which of the following is correct ?

A. Both (A) and (B) is wrong

B. (A) is correct and (B) is wrong

C. (A) is wrong and (B) is correct

D. Both (A) and (B) are correct

Answer: D

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3. A current of $2A$ flows through a 2Ω resistor when connected across a battery. The same battery supplies a current of $0.5A$ when connected across a 9Ω resistor. The internal resistance of the battery is

A. 0.5Ω

B. $1/3\Omega$

C. $1/4\Omega$

D. 1Ω

Answer: B

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4. If power dissipated in the 9Ω resistor in the circuit shown in 36 watt, the potential difference across the 2Ω resistor is

A. 4 volt

B. 8 volt

C. 10 volt

D. 2 volt

Answer: C

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5. In the circuit shown in the figure, if the potential at point A is taken to be zero, the potential at point B is

A. $+1V$

B. $-1V$

C. $+2V$

D. $-2V$

Answer: A

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6. In the circuit shown, the cells A and B have negligible resistance. For $V_A = 12V, R_1 = 500\Omega$ and $R = 100\Omega$, the galvanometer (G) shows no deflection. The value of V_B is

A. $4V$

B. $2V$

C. $12V$

D. $6V$

Answer: B

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7. If voltage across a bulb rated 22 volt 100 watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is

A. 20%

B. 2.5%

C. 5%

D. 10%

Answer: C

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8. The power dissipated in the circuit shown in the figure is 30 watts. The value of R is

A. 20Ω

B. 15Ω

C. 10Ω

D. 30Ω

Answer: C

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9. $2A$ cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by

A.

B.

C.

D.

Answer: C

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10. The resistance of the four arms P, Q, R and S in a Wheatstone's bridge are $10 ohm 30 ohm$ and $90 ohm$ rerspectively. The e.m.f. and internal resistance of the cell are $7 vo <$ and $5 ohm$ respectively. If the galvanometer resistance is $50 ohm$, the current drawn for the cell will be

A. $0.1 A$

B. $2.0 A$

C. $1.0A$

D. $0.2A$

Answer: D

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11. The internal resistance of a $2.1V$ cell which gives a current $0.2A$ through a resistance of 10Ω

A. 0.8Ω

B. 1.0Ω

C. 0.2Ω

D. 0.5Ω

Answer: D

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12. A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be

A. 8Ω

B. 16Ω

C. 2Ω

D. 4Ω

Answer: B

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13. Two cities are 150 km apart. Electric power is sent from one city to antoerh city through copper wires. The fal of potential per km is 8 volt and the average resistance per km is 0.5Ω.

The power loss in the wire is

A. 19.2 W

B. 19.2 W

C. 12.2 W

D. 12.2 W

Answer: B

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14. The resistance in the two arms of the meter bridge are 5Ω and $R\omega$ respectively. When the resistance R is shunted with an equal resistance, the new balance point is at $1.6l_1$. The resistance R is

A. 10Ω

B. 15Ω

C. 20Ω

D. 25Ω

Answer: B

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15. A potentiometer circuit has been setup for finding. The internal resistance of a given cell. The main battery used a negligible internal resistance. The potentiometer wire itsefl is $4m$ long. When the resistance, R, connected across the given cell, has value of

(i) Infinity 9.5Ω,

(ii) the 'balancing length' , on the

potentiometer wire are found to be $3m$ and $2.85m$, respectively.

The value of internal resistance of the cell is

A. 0.25Ω

B. 0.95Ω

C. 0.5Ω

D. 0.75Ω

Answer: C

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

A. $V_A = V_B \neq V_C$

B. $V_A \neq V_B \neq V_C$

C. $V_A = V_B = V_C$

D. $V_A \neq V_B = V_C$

Answer: C

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

A. drift velocity

B. electric field

C. current density

D. current

Answer: D

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

A. 44Ω

B. 48Ω

C. 32Ω

D. 40Ω

Answer: C

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19. Two metal wires of identical dimesnios are connected in series. If σ_1 and σ_2 are the conducties of the metal wires respectively, the effective conductivity of the combination is

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

B. $\dfrac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$

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

D. $\dfrac{\sigma_1 + \sigma_2}{2\sigma_1 \sigma_2}$

Answer: C

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20. A circuit contains an ammeter, a battery of $30V$ and a resistance $40.8ohm$ all connected in series. If the ammeter has a coil of resistance $480 ohm$ and a shunt of $20 ohm$, the reading in the ammeter will be

A. $2A$

B. $1A$

C. $0.5A$

D. $0.25A$

Answer: C

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

A. $\dfrac{E_0 l}{L}$

B. $\dfrac{L E_0 r}{(r + r_1) l}$

C. $\dfrac{L E_0 r}{l r_1}$

D. $\dfrac{E_0 r}{(r + r_1)} \cdot \dfrac{l}{L}$

Answer: D

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22. A potentiometer wire is $100cm$ long hand a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obatined at $50cm$ and $10cm$ from the positive end of the wire in the two cases. The ratio of emfs is:

A. $3:4$

B. $3:2$

C. $5:1$

D. $5:4$

Answer: B

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23. In Fig. 6, l and m are two parallel tangents to a circle with centre O, touching the circle at A and B respectively. Another tangent at C intersects the line at D and in at E. Prove that

ZDOE=90.

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

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

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

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

Answer: C

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

A. $-3V$

B. $+3V$

C. $+6V$

D. $+9V$

Answer: D

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

A. 230Ω

B. 46Ω

C. 26Ω

D. 13Ω

Answer: C

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26. The resistance of a wire is r ohm. If it is melted and stretched to n times its original length , its new resistance will be

A. R/n

B. n^2R

C. R/n^2

D. nR

Answer: B

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27. A potentiometer is an accurate and versatile device to make electrical measurements of $E.M.F.$ because the method involves

A. potential gradients

B. a condition of no current flow through the galvanometer

C. a combination of cells, galvanometer and resistances

D. cells

Answer: B

Watch Video Solution

28. A set of $'n'$ equal resistor, of value of $'R'$ each are connected in series to a battery of emf $'E'$ and internal resistance $'R'$. The current drawn is I. Now, the $'n'$ resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10.1. The value of $'n'$ is

A. 10

B. 11

C. 20

D. 9

Answer: A

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29. 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 correct relationship between I and n?

A.

B.

C.

D.

Answer: A

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

A. Violet - Yellow - Orange - Silver

B. Yellow - Violet - Orange - Silver

C. Yellow - Green - Violet - Gold

D. Green - Orange - Violet - Gold

Answer: B

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31. which of the following acts as a circuit protection device?

A. fuse

B. conductor

C. inductor

D. switch

Answer: A

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32. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance. The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be

A. $2:1$

B. $4:9$

C. $9:4$

D. $1:2$

Answer: B