PHYSICS

BOOKS - PRADEEP PHYSICS (HINGLISH)

CURRENT ELECTRICITY

Solved Examples

1. What is the current flowing through a conductor if 1 million electrons are crossing in 1 millisecond through a cross section of it from A to B ? Charge on an electron $= 1.6 \times 10^{-19} C$.

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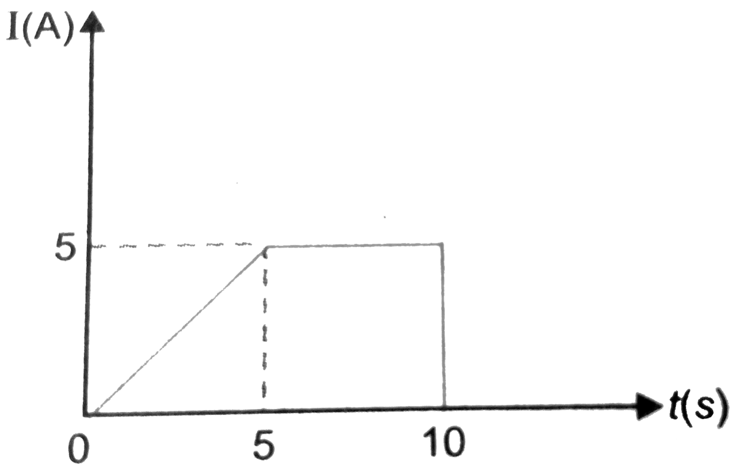
2. 

shows a plot of current I through the cross-section of a wire over a time interval of 10s. Find the amount of charge that flows through the wire during this time period.

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3. Estimate the average drift velocity of conduction electrons in a copper wire of cross-sectional area $2.5 \times 10^{-7} m^2$, carrying a current of 2.7 A. Assume the density of conduction electrons to be $9 \times 10^{28} m^{-3}$.

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4. What is the length of a nichrome wire of radius 0.32 mm, resistance 9.3Ω and resistivity $15 \times 10^{-6} \Omega m$? If a potnetial differences of 10 V is applied across the wire, what will be the current in the wire ?

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5. Find the conductance of a conductor of resistance 2 milli ohm.

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6. 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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7. The resistance of a conductor at $30^\circ C$ is 3.25Ω and at $100^\circ C$ is $3.95\Omega.$ Calculate the temperature coefficient of resistance of the conductor and the resistance of the conductor at $0^\circ C.$

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8. For the given carbon resistor, let the first strip be yellow, second strip be red, third strip be orange and fourth be gold. What its resistance?

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9. The resistance of the given carbon resistor is $(24 \times 10^6 \pm 5\,\%)\,\Omega$. What is the sequence of colours on the strips provided on resistor?

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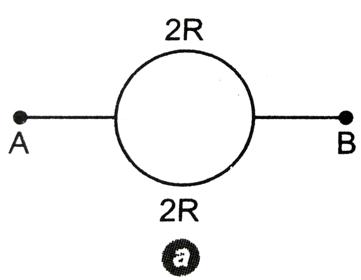
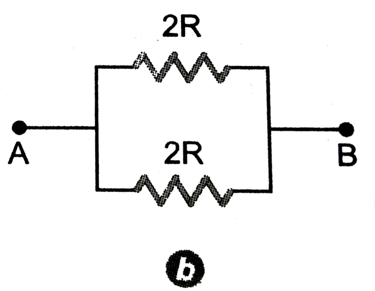
10. A wire of resistance 4R is bent in the form of a circle. What is the effective resistance between the ends of the diameter?





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11. A voltmeter of resistance 995Ω is connected across a cell of emf 3V and internal resistance 5Ω. Find the potential difference across the voltmeter, that across the terminals of the cell and percentage error in the reading of voltmeter.

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12. 45 cells each of internal resistance 0.4Ω and emf 2.0 V are used to send current through an external circuit of resistance 2.0Ω. What will the best mode of grouping them for maximum current? Find the currnet in the external circuit.

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13. In a Wheatstone bridge circuit, $P = 5\Omega, Q = 6\Omega, R = 10\Omega$ and $S = 5\Omega$. Find the additional resistance to be used in series with S, so that the bridge is balanced.

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14. A current of 1.0 mA is flowing through a potentiometer wire of length 4 m and of resistance 4Ω, find the potential gradient of potentiometer wire

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15. A bulb of 484Ω is producing light when connected to 200 V supply. What is the electric power of the bulb?

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16. How much current is drawn by the motor of 0.5 hp from 220 volt supply?

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17. A bulb of 100 W is operating for 6 hours a day. Find the units of energy consumed in 7 days.

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18. An electric motor operates on a 110 V supply and draws a current of 10 A. If the motor yields a mechanical power of 330 watt, what is the efficiency of the motor ?

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19. Show that one ampere is equivalent to flow of 6.25×10^{-18} elementary electrons per second ? Charge on electron $= 1.6 \times 10^{-19} C$.

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20. How many electrons pass through a lamp in one minute, if the current is 300 m A?

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21. If 10^6 electrons pass from a point towards another point B in a conductor in one microsecond. Find the magnitude and direction of current. Give charge of an electron is 1.6×10^{-19} C.

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22. In an atom an electron revolves around the nucleus in a circular orbit at the rate of 6×10^{15}

revolutions per second. Calculate the equivalent current in milliampere. Take value of electromic charge $= 1.6 \times 10^{-19} C$.

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23. In Bohr model of hydrogen atom, the electron revolves around the nucleus in a circular orbit of radius 5.0×10^{-11} m with a speed $2.2 \times 10^6 ms^{-1}$. Find the equivalent current. (Electronic charge = 1.6×10^{-19}coulomb)

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24. In a discharge tube, the number of protons drifting across a cross-section is 1.5×10^{18} per second, while the number of electrons drifting in opposite direction across that cross-section is 3.0×10^{18} per second. Find the total current crossing the given cross- section.

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25. If 0.8 mole of electrons flow through a wire in 55 minutes. What is (a) the total charge in kilocoulomb that passes through the wire and (b) the magnitude of the current? Avogadro's number $= 6 \times 10^{23}$ per mole.

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26. In a conductor, 10^{16} electrons move from a point A towards point B in 1 milli second. 10^{14} positive ions move from a point B towards point A in 1 milli second. What is the current in ampere and its direction? Charge on electron = charge on position ion $= 1.6 \times 10^{-19} C$.

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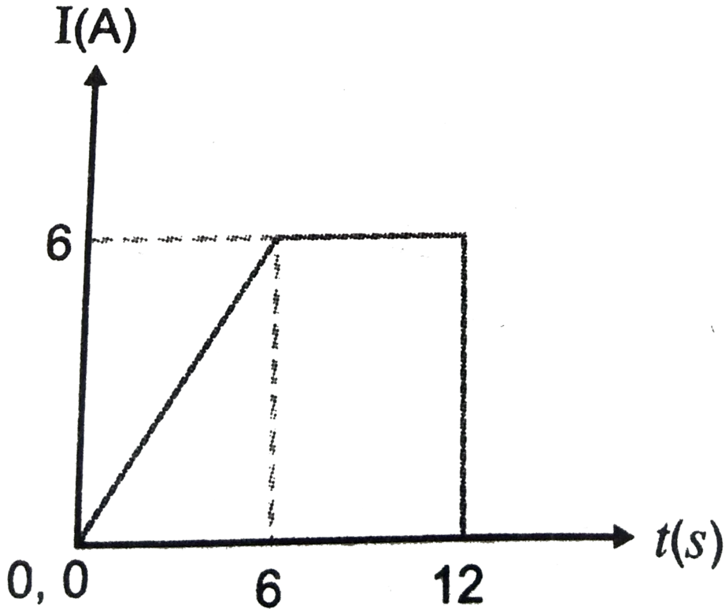

27.

The variation of current I through the cross section of the wire over a time interval of 12 second. Find the charge that flows in this wire in 12 seconds.

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28. The charge flowing in a conductor varies time as,

$$q = at - \frac{1}{2}bt^2 + \frac{1}{6}ct^3$$

Where a,b,c are positive constants. Then, find (i) the initial current (ii) the time after which the value of current reaches a maximum value (iii) the maximum or minimum value of current.

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29. A steady beam of α-particles travelling with kinetic energy $E = 83.5 keV$ carries a current of $I = 0.2 \mu A.$ Mass of α-particle

$= 6.68 \times 10^{-27} kg.$

(i) If this beam strikes a plane surface at an angle $\theta = 60^\circ$ with normal to the surface, how many α-particles strike the surface in t=4 second?

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30. At room temperature copper has free electron density of $8.4 \times 10^{28} per m^3$. The copper conductor has a cross-section of $10^{-6} m^2$ and carries a current of 5.4 A. What is the electron drift velocity in copper?

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31. The number of free electrons per 100 mm of ordinary copper wire is 2×10^{21}. The average drift speed of electorn is $0.25mm/s$. What is the current flowing?

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32. A copper wire of diameter 1.0 mm carries a current of 0.2 A. Copper has 8.4×10^{28} atoms per cubic metre. Find the drift velocity of electrons, assuming that one charge carrier of 1.6×10^{-19} C is associated with each atom of the copper.

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33. A 60 coulomb of charge flows through a wire in half minute. The radius of the wire is 1 mm. The wire contains 5×10^{22} electrons per cubic centimetre. Calculate the current and drift velocity.

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34. A current of 3 A is flowing through a wire of length 2 m and cross- sectional area $1mm^2$. If wire contains $10^{29}\text{electrons}/m^3$, calculate the average time taken by an electron to cross the length of the wire.

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35. There is a copper wire of length 2.2 m, of area of cross-section 2.0sq.mm, carrying a current of 6.0A. If the number density of electrons in copper is $8.5 \times 10^{28} m^{-3}$, find the time taken by an electron to drift from one end to another end of the wire.

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36. If the free electron density of copper is $8.6 \times 10^{28} m^{-3}$ and resistivity of copper at room temperature is $1.7 \times 10^{-6} \Omega cm$, find the relaxation time for the free electrons of copper. Given, mass of electron $= 9.1 \times 10^{-31} kg$, and charge of electron $= 1.6 \times 10^{-19} C$.

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37. What is the drift velocity for the electrons in a calculator when an electric field of strength $200V/m$ is applied on it and mobility of electrons is $4.5 \times 10^{-6} m^2 V^{-1} s^{-1}$?

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38. A copper wire of length 2.0 m, of cross-sectional area 2.0 mm square carries a current of 0.4A. It is assumed that there is only one electron per atom. Atomic mass of copper is 63 g and density of copper is $8.9 g/c$. Find the drift velocity for the electrons in the wire. Also find the mobility of electrons if a pot. difference of 100 V is applied across this wire.

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39. If the current flowing through a copper wire of 1mm diameter is 1.1A. The density of copper is $9gcm^{-3}$ and atomic mass of copper is 63 u. One free electron is contributed by each atom of copper. Find the drift velocity of electron. Avogardo's number $= 6.0 \times 10^{26}$ per kg atom.

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40. Find the current flowing through a copper wire of length 0.2m, area of cross-section $1mm^2$, when connected to a battery of 4 V. Given that electron mobility $= 4.5 \times 10^{-6} m^2 V^{-1} s^{-1}$ and charge on electron $= 1.6 \times 10^{-19} C$. The number density of electron in copper is $8.5 \times 10^{28} m^{-3}$.

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41. (a) Estimate the average drift speed of conduction electrons in a copper wire of cross sectional area $1.0 \times 10^{-7} m^2$ carrying a current of 1.5 A. Assume that each copper atom contributes roughly one conduction electron. The density of copper is $9.0 \times 10^3 kgm^{-3}$ and its atomic mass is $63.5u$. (b) Compare the drift speed obtained with the speed of propagation of electric field along the conductor, which causes the drift motion.

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42. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm diameter and having a resistance of 2.0Ω.

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43. A wire of resistance 5.0Ω is used to wind a coil of radius 5 cm. The wire has a diameter 2.0 mm and the specific resistance of its material is $2.0 \times 10^{-7} \Omega m$. Find the number of turns in the coil.

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44. A wire of 10Ω resistance is stretched to thrice its original length. What will be its (i) new resistivity and (ii) new resistance?

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45. A wire has a resistance of 16Ω. It is melted and drawn into a wire of half its length. Calculate the resistance of new wire. What is the percentage change in its resistance?

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46. A piece of silver has a resistace of 2Ω. What will be the resistance of constantan wire of two-third length and one-third diameter, if the specific resistance of constantan is 30 times that of silver.

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47. There are two wires A and B of same mass and of the same material. The diameter of wire A is one-third the diameter of wire B. If the resistance of wire A is 30Ω, find the resistance of wire B.

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48. In a discharge tube the number of hydrogen ions (i.e., protons) drifting across a cross- section per second is 1.0×10^{18}, while number of electrons drifting in opposite direction across another cross-section is 2.5×10^{18} per second. If the supply voltage is 220 V, what is the effective resistance of the tube ?

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49. The external diameter of a 4 m long hollow tube is 10 cm and thickness of its wall is 5 mm. If the specific resistance of the copper is $1.7 \times 10^{-8} \Omega m$, then calculate its resistance.

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50. A potential difference of 3V is applied across a conductor of resistance 1.5Ω.

Calculate the number of electrons flowing through it in one second. Given charge on electron, $e = 1.6 \times 10^{-19} C$.

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51. Find the relaxation time for free electrons in copper, if the density of mobile electrons is $8.4 \times 10^{28} m^{-3}$. The resistivity of copper at room temperature is $1.7 \times 10^{-8} \Omega m$.

Given : mass of electron $= 9.11 \times 10^{-31} kg$ and charge on electron $= 1.6 \times 10^{-19} C$.

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52. A wire of resistance 5Ω is drawn out so that its length is increased by twice its original length. Calculate its new resistance.

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53. A copper wire is stretched to make it 0.2% longer. What is the percentage change in its resistance?

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54. When 5 V potential difference is applied across a wire of length 0.1 m. The drift speed of electrons is $2.5 \times 10^{-4} ms^{-1}$. If the electron density in the wire is $8 \times 10^{28} m^{-3}$, calculate the resistivity of the material of wire

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55. Find the resistivity of a conductor in which a current density of 2.5 Am^{-2} is found to exist, when an electric field of $15 Vm^{-1}$ is applied on it.

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56. Calculate the electrical conductivity of the material of a conductor of length 3 m, area of cross- section $0.02mm^2$, having a resistance of 2Ω.

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57. A wire carries a current of 0.5A, when a potential differnece of 1.5 V is applied across it. What is its conductance ? If the wire is of length

3 m and area of cross-section $5.4 mm^2$, calculate its conductivity.

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58. Calculate the electric field in a copper wire of cross-sectional area 2.0 mm square carrying a current of 2 A. The resistivity of copper is $1.7 \times 10^{-8} \Omega m$.

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59. An aluminium wire of diameter 2.5 mm is connectedf in series with a copper wire of diameter1.6 mm. A current of 2.0 A is passed through them. Find (a) current density in aluminium wire, (b) drift velocity of electrons in copper wire. Given the number density of conduction electrons in copper is $10^{29} m^{-3}$.

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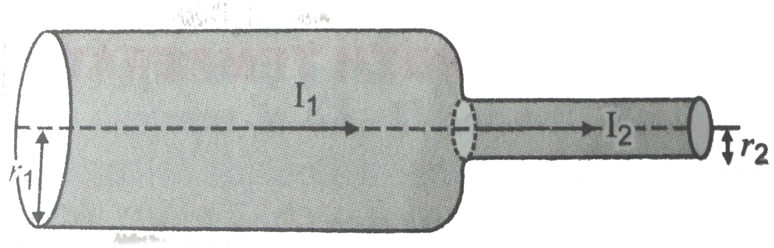
60. Current flows through a constricted conductor as shown in figure



The radius and the current density to the left of constriction are 2 mm and $4.2 \times 10^5 Am^{-2}$. (a) How much current flows through the constriction? (b) If the current density is doubled as emerges from the right side of the constriction, what is the radius r_2?

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61. Calculate the electric field in a copper wire of cross-sectional area 2.0 mm square carrying a current of 2 A. The resistivity of copper is $1.7 \times 10^{-8} \Omega m$.

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62. The number density of electron in copper is $8.5 \times 10^{28} m^{-3}$. Find the current flowing through a copper wire of length 20 cm, area of cross section is 1 mm square,when connected to a battery of 3 V. Given the electron mobility

$= 4.5 \times 10^{-6} m^2 V^{-1} s^{-1}$ and electron charge $= 1.6 \times 10^{-19} C$.

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63. At what temperature(in kelvin) would the resistance of a copper wire be half its resistance at $0^{\circ} C$? Temperature coefficient of resistance of copper is $3.9 \times 10^{-3} .^{\circ} C^{-1}$.

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64. A tungsten coil has a resistance 16Ω at $20^{\circ} C$. If the temperature coefficient of resistance of tungsten is $0.004^{\circ} C^{-1}$, calculate the resistance of the coil at $80^{\circ} C$.

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65. A conductor has a cross-section of $15 mm^2$ and resistivity of $7.6 \times 10^{-8} \Omega$ m at $0^{\circ} C$. If the temperature coefficient of resistance of the material of the conductor is $5 \times 10^{-3} .^{\circ} C^{-1}$, calculate its resistance for 2 km length of conductor when its temperature is $60^\circ C$.

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66. The heating element of an electirc toaster is of nichrome. When a vary small current passes through it, at room temperrature $27^\circ C$, its resistance is 75.3Ω. When toaster is connected to a 230V supply, the current settles after a few seconds to a steady value of 2.68A. What is the steady temperature of nichrome element? The temperature coefficient of resistance of nichrome over averged temperature range is $1.7 \times 10^{-4} \hat{}(\circ)C^{-1}$.

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67. The resistance of a platinum wire of platinum resistance thermometer at the ice point is 5Ω and at steam point is 5.23Ω. When therometer is insertes in a hot bath, the resistance of the platinum wire is 5.795Ω. Calculate the temperature of the bath?

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68. A heating element using nichrome connected to a 115 V supply draws a current of 1.6A which settles after a few seconds to a steady value of 1.4 A. What is the steady temperature of the heating element if the room temperature is $30^{\circ} C$? Temperature coefficient of resistance of nichrome averaged over the temperature range involved is $1.7 \times 10^{-4} .^{\circ} C^{-1}$.

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69. A standard coil marked 5Ω is found to have a resistance of 5.128Ω at $30^{\circ}C$. Calculate the temperature at which the marking is correct. The temperature coefficient of resistance of the material of the coil is $.0042^{\circ}C^{-1}$.

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70. A potential difference of 120 V is applied to a coil at temperature of $12^{\circ}C$ and the current is 6A. What will be the mean temperature of the coil when the curreny has fallen to 3 A, the applied voltage being the same as before ? Given temperature coefficient of resistance coil is $.00427^\circ C^{-1}$ at $0^\circ C$.

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71. The resistance of iron and copper wires at $20^\circ C$ are 4.1Ω and 4.3Ω respectively. At what temperature will the resistance be equal ? Temperature coefficient of resistance for iron is $5.0 \times 10^{-3} K^{-1}$ and for copper is $4.0 \times 10^{-3} K^{-1}$. Neglect any thermal expansion.

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72. Resistivity of the material of a conductor of uniform cross-section varies along its length as $\rho = \rho_0(1 + \alpha x)$. Find its resistance if its length is L and area of cross-section is A.

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73. How will you repersent a resistance of $3700\Omega \pm 10\,\%$ by colour code?

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74. What is the colour of the third band of a coded resistor of resistance $2.3 \times 10^2 \Omega$?

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75. A current of 2 mA is passed through a colour coded carbon resistor with first, second and third rings of yellow, green and orange colours. What is the voltage drop across the resistor?

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76. A voltage of 5 V is applied across a colour coded carbon resistor. A current of 5 mA flows through it. What are the colours of second and third band of coded colour resistor?

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77. Two coils have a combined resistance of 9Ω when connected in series and 2Ω when connected in parallel. Find the resistance of each coil.

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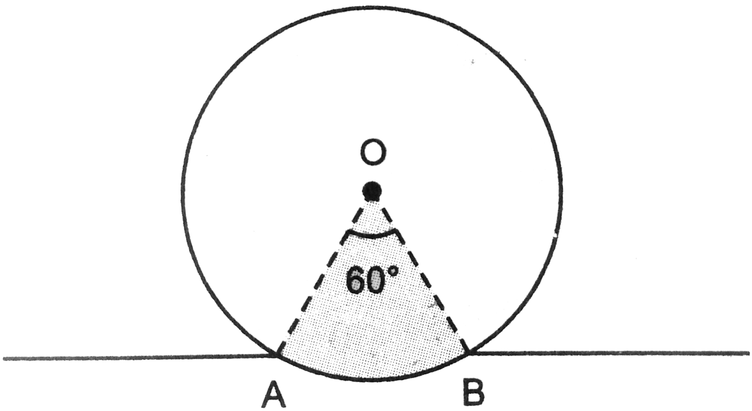
78. A resistor of 24Ω resistance is bent in the form of a circle as



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What is the effective resistance between points A and B?

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79. Two resistance are in the ratio 1:4. if these are connected in parallel, their total resistance becomes 20 ohm. Find the value of each resistance

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80. Two conductors of conductnaces G_1 and G_2 are connected in series. They are connected in parallel to another conductor of conductance G_3. Determine their equivalent conductance.

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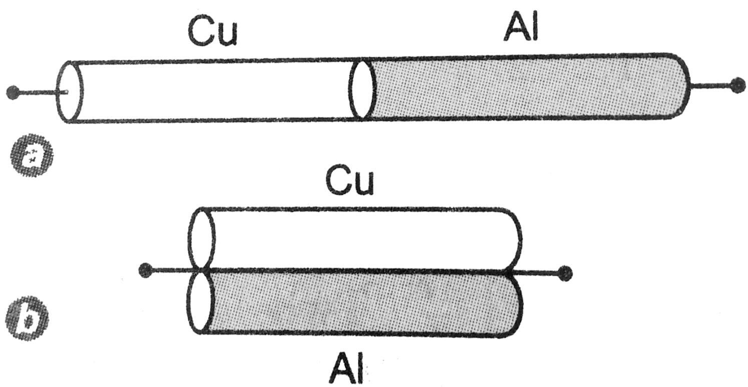
81. Two rods of copper and aluminium of each of equal length 20 cm and equal cross-sectional area $2mm^2$. They are joined (i) in series and (ii) in parallel as shown in figure. Find the resistance of the combination in each case. Resistivity of copper $= 1.7 \times 10^{-8} \Omega m$ and resistivity of aluminium $= 2.6 \times 10^{-8} \Omega m$.



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82. In the given network of resistors, Find the equivalent resistance (i) between the points A and B (ii) between the points A and D (iii) between the points A and C.

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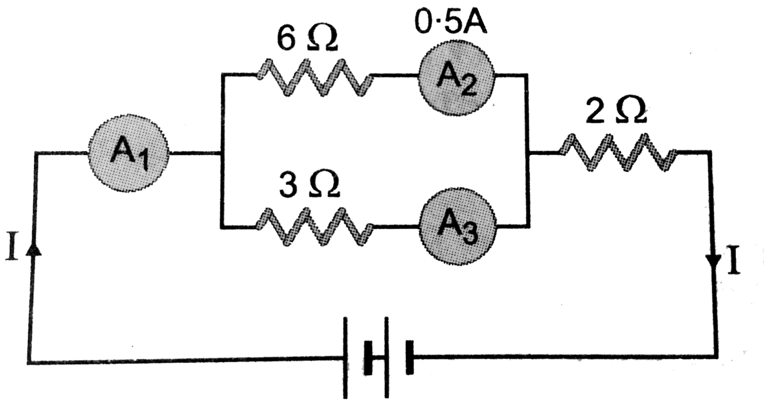
83.



A_1, A_2 and A_3 Are the ammeters and A_2 reads 0.5A. (i) What are the readings of ammeters A_1 and A_3 ? (ii) What is the total resistance of the circuit ?

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84. The resistance of two conductors in series is 40Ω and their resistance becomes 6.4Ω, when connected in parallel. Find the resistance of individual conductors.

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85. A resistor of 5Ω is connected in series with a parallel combination of a number of resistors each of 5Ω. If the total resistance of the combination is 6Ω , how many resistor are in parallel?

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86. A uniform wire of resistance R is shaped into a regular n sided polygon where n is even. Find the equivalent resistance between (i) opposite corners of polygon (ii) adjacent corners of polygon .

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87. 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

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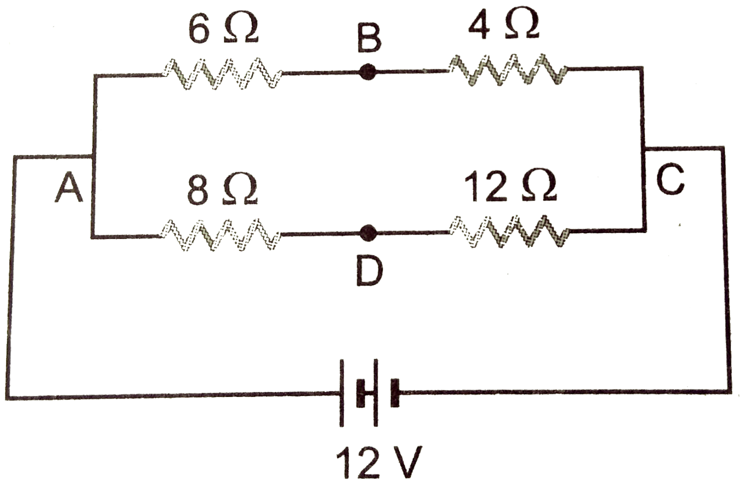
88. Calculate the potential difference between points B and D of the network of resistance shown in figure



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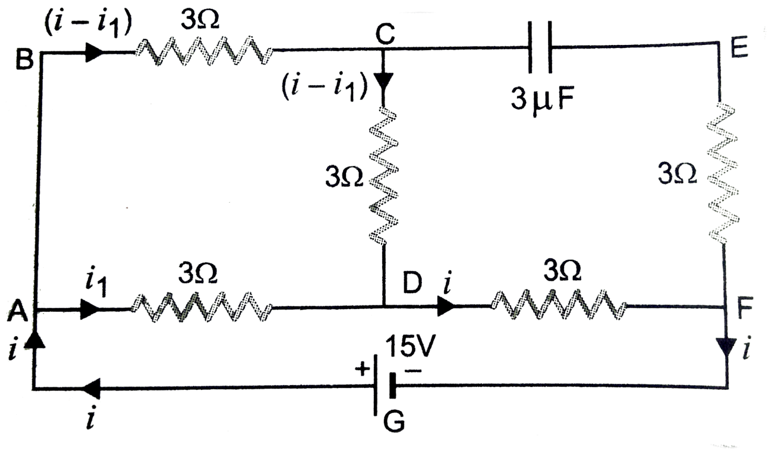
89. In the circuit shown in figure



Find the potential differnece across capacitor.

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90. Four resistors of 12Ω each are connected in parallel . Three such combinations are then connected in series. What is the total resistance ?

If a battery of 9 V emf and negligible internal resistance is connected across the networks, find the current flowing through of each resistors.

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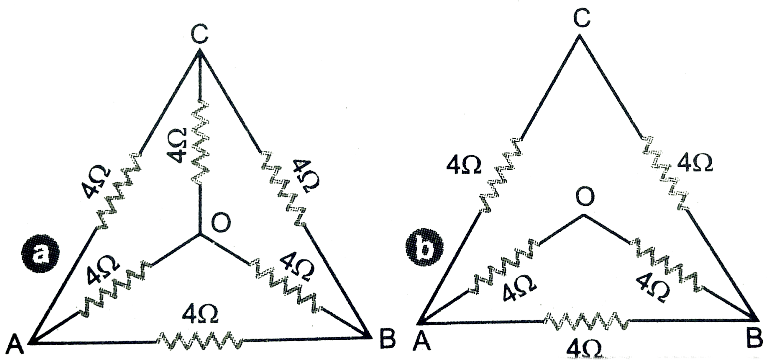
91. Six equal resistances each of 4 ohm are connected to form a net work as shown in figure



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What is the resistance between A and B ?

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92. A resistor is connected to a battery of emf 10 V and internal resistance 0.3Ω. What is the resistance of the resistor to be inserted in the circuit for the circuit current 1.2A?

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93. A battery of emf 3V and internal resistance r is connected in series with a resistor of 55Ω through an ammeter of resistance 1Ω. The ammeter reads 50 mA. Draw the circuit diagram and calculate the value of r.

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94. The cell has an emf of $2V$ and the internal resistance of this cell is 0.1Ω, it is connected to resistance of 3.9Ω, the voltage across the cell will be

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95. A cell of emf ε and internal resistance r gives a current of 0.5 A with an external resistance of 12Ω and a current of 0.25 A with an external resistance of 25Ω. Calculate (a) internal resistance of the cell and (b) emf of the cell.

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96. A uniform wire of resistance 12Ω is cut into three pieces in the ratio 1 : 2 : 3 and the three pieces are connected to form a triangle. A cell of emf 8 V and internal resistance 1Ω is connected across the highest of the three resistors. Calculate the current through each part of the circuit.

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97. The emf of a battery is 6.0 V and its internal resistance is 1.5Ω. Its potential differences is measured by a voltmeter of resistance 1000Ω. Calculate the percentage error in the reading of emf shown by voltmeter.

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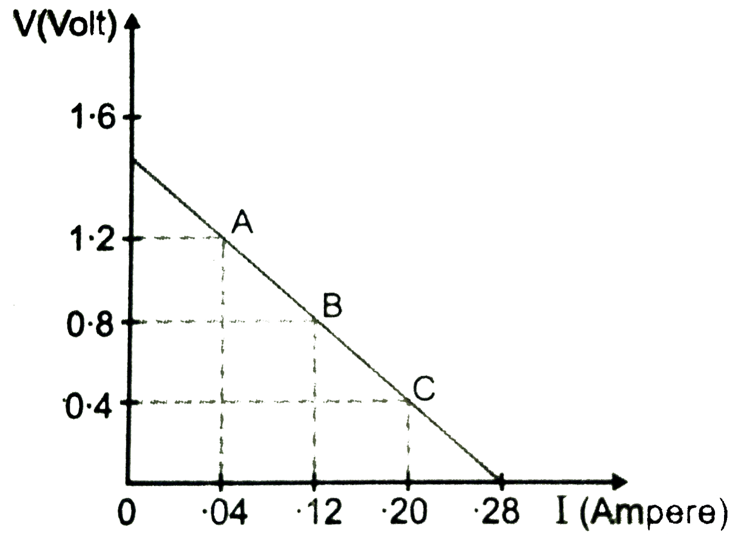
98. Potential differences across the terminals of a cell were measured (in volt) against different currents (in ampere) flowing through the cell. A graph was drawn which was a straight line ABC as shown in figure



Determine from graph (i) emf of the cell (ii) maximum current obtained from the cell and (iii) internal resistance of the cell.

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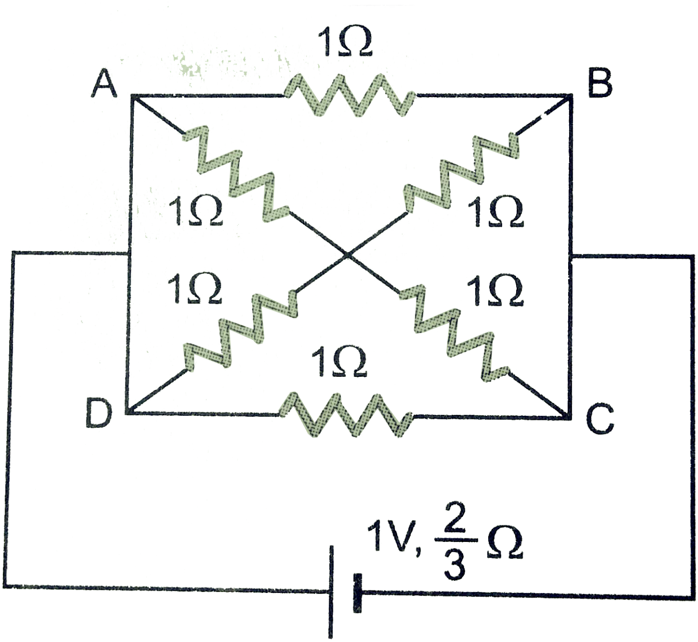
99. Find the current drawn from a cell of emf 1 V and internal resistance $(2/3)\Omega$ connected to the network shown in figure



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100. Two identical cells of emf 1.5 V each joined in parallel provided supply to an external circuit cosisting of two resistances of 17Ω each joined in parallel. A very high resistance voltmeter reads. The teminal voltage of cells to be 1.4V. Calculate the internal resistance of each cell.

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101. Two cells, E_1 and E_2 of emfs 4 V and 8 V having internal resistances 0.5Ω and 1.0Ω respectively are connected in opposition to each other. This combination is connected in opposition to with resistance of 4.5Ω and 3.0Ω. Another resistance of 6Ω is connected in parallel across the 3Ω resistor. (a) Draw the circuit diagram (b) Calculate the total current flowing through the circuit. (c) Terminal potential difference acrss cell E_1 and E_2.

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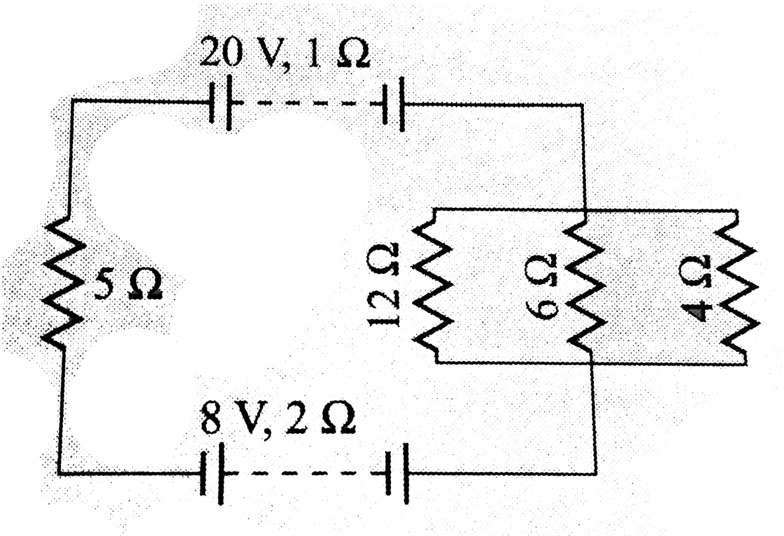
102. A 20 V battery of internal resistance 1Ω is connected to three coils of $12\Omega, 6\Omega$, and 4Ω in parallel, a resistor of 5Ω and a reversed battery (emf $8V$ and internal resistance 2Ω) as shown in figure. Calculate (a) the current in the circuit,(b) current in resistor of 12Ω coil, and (c) potential difference across each battery.



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103. Thirty six cells each of emf 1.5 V and internal resistance 0.5Ω are used to send current through an external resistor of resistance 2Ω. What is the best mode of grouping them and the current through the external resistor

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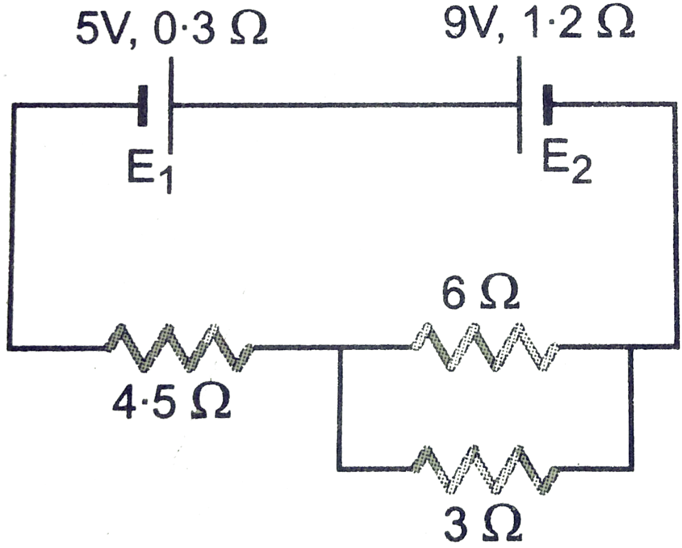
104. Two cells E_1 and E_2 in the circuit shown in figure, have emfs of 5 V and 9 V and internal resistance of 0.3Ω and 1.2Ω respestivley. Calculate the value of current flowing through the resistance of 3Ω.



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105. (a) Three cells of emfs, 1.5 V, 2.0V and 2.5 V are connected in series. Their internal resistance are $0.20\Omega, 0.15\Omega$ and 0.15Ω respectively. The battery is connected to an external resistor of

5.5Ω via a very low resistance ammeter, what would be the reading of ammeter?

(b) If the three cells above were joined in parallel, would they be characterised by a definite emf and internal resistance (independent of their individual internal resistance)? If not, how will you obtain currents in different branches of the circuit ?

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106. Two identical cells , whether joined together in series or in parallel give the same current, when connected to external resistance of 1Ω. Find the internal resistance of each cell.

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107. Four identical cells each of emf 2V, are joined in parallel providing supply of current to external circuit consisting of two 15Ω resistors joined in parallel. The terminal voltage of the cells ae read by an ideal voltmeter is 1.6V. Calculate the internal resistance of each cell.

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108. 8 cells, each of internal resistance 0.5Ω and emf 1.5V are used to send a current through an external ressistor of (a) 200Ω (b) 0.002Ω (c) 1.0Ω. How would you arrange them to get the maximum current in each case? Find the value of current in each case.

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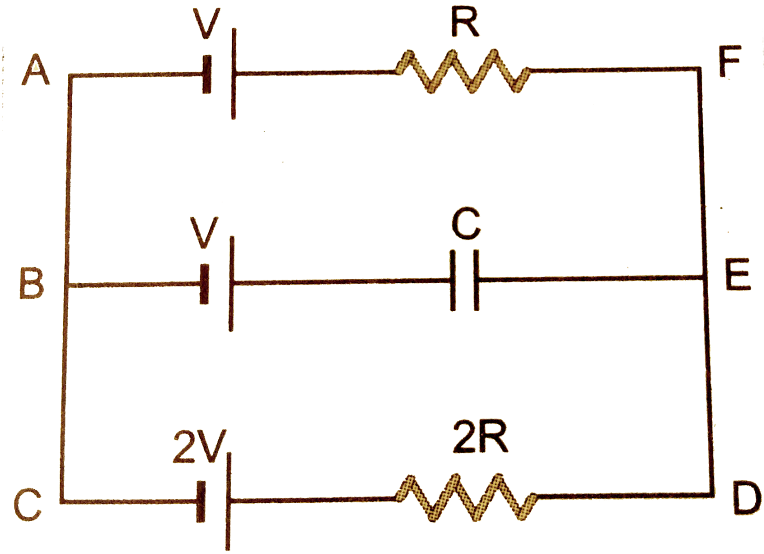
109. In the given circuit as shown in figure, in the steady state, obtain the expression for (i) potential drop (ii) the charge and (iii) the energy stored in the capacitor C.



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110. It is desired to make a 20.0Ω coil of wire whose temperature coefficient of resistance is zero. To do this, a carbon resistor of resistance

R_1 is placed in series with an iron resistor of resistance R_2. The proportion of iron and carbon are so chosen that $R_1 + R_2 = 20\Omega$ for all temperatures near $20^\circ C$. Find the values of R_1 and R_2. Temperature coefficient of resistance for carbon, $\alpha_C = -0.5 \times 10^{-3} / ^\circ C$ and that of iron is $\alpha_{Fe} = 5 \times 10^{-3} / ^\circ C$.

Watch Video Solution

111. A galvanometer, together with an unknown resistance in series, is connected across two identical batteries of each $1.5V$. When the batteries are connected in series,the galvanometer records a current of $1A$, and when the batteries are connected in parallel, the current is $0.6A$. In this case, the internal resistance of the battery is $1/' * '\Omega$.

What is the value of '*'?

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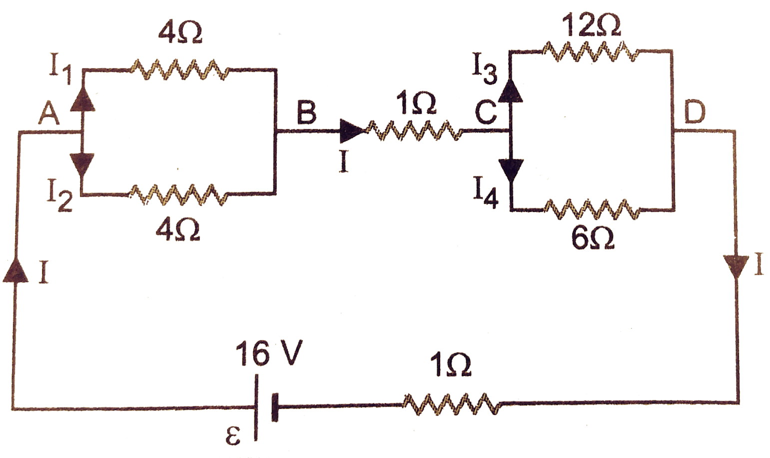
112. Determine the potential difference between the points C and D in figure.

View Text Solution

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



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114. A wire is carrying. Is it charged?

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115. It is easier to confine electric current to definite paths (by the use of electric insulators) than to direct heat flow along definite routes using heat insulators. Why?

Watch Video Solution

116. A large number of free electrons are present in metals. Why is there no current in the absence of electric field across ot, but threre is a current in the presence of electric field?

Watch Video Solution

117. Current I is flowing through a copper wire of radius r with drift velocity of electorns v_d. If this current is passed through another copper wire of same length and double the raduis, what will be the drift velocity of free electrons in it?

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118. A potential difference V is aplied across a conductor of length l. How is the drift velocity affected when V is doubled and l is halved ?

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119. A non-conducting ring of radius r has charge q distributed unevenly over it. What will be the equivalent current if it rotates with an angular velocity Ω?

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120. A potential difference V is applied to a conductor of length L, diameter D. How are electric field E, the drift velocity v_d and the resistance R affected when (i) V is doubled (ii)L is doubled (iii) D is doubled ?

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121. A wire whose cross-sectional area is incereasing linearly from its one end to the other, is connected across a battery of V volts. Which of the following quantities remain constant in the wire ?

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122. Plot a graph showing the variation of resistance of a conducting wire as function of its radius, keeping the length of a wire and its temperature as constant.

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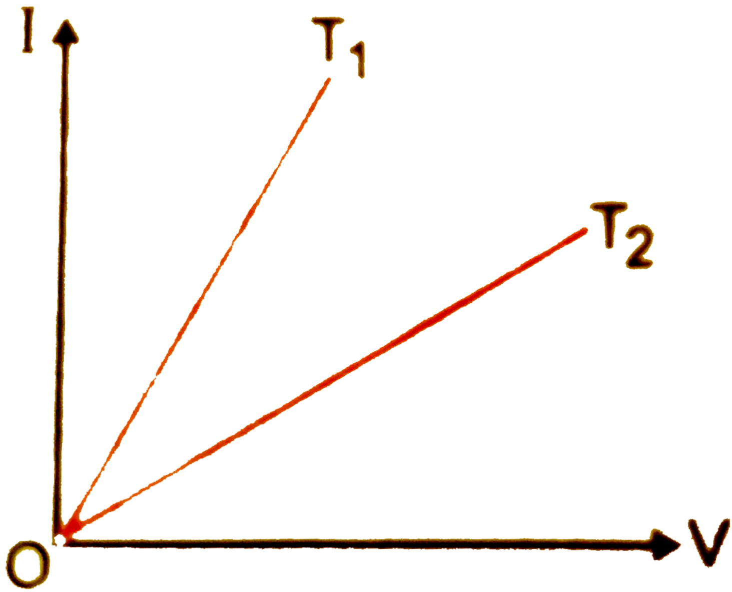
123. V- I graph for a metallic wire at two different temperature T_1 and T_2 is shown in figure. Which of the two temperature is higher and why?



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124. Plot a graph showing the variation of current density (J) versus the electric field (E) For two conductors of different materials. What information from this plot regarding the properties of the conducting material, can be obtained which can be used to select suitable materials for use in making (i) standard resistance and (ii) connecting wires in electric circuit?

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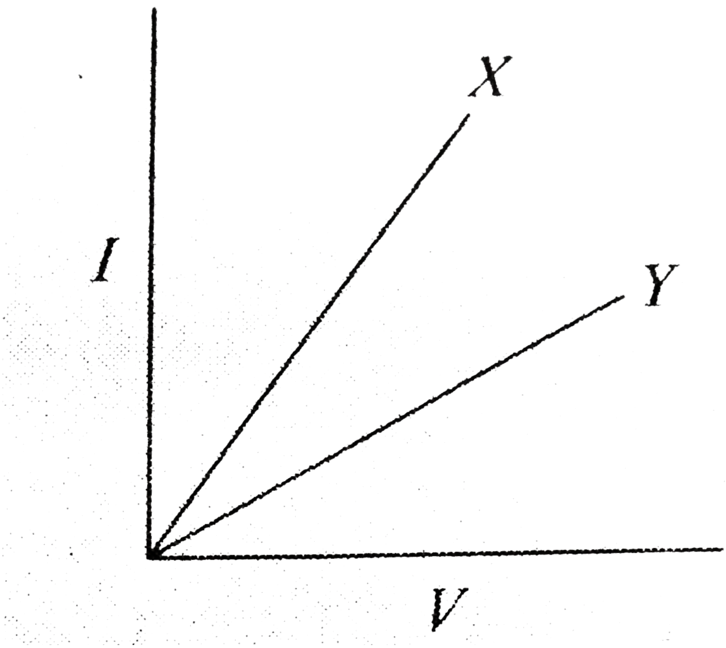
125. The voltage-current variations of two metallic wire X and Y at constant temperature is shown in fig. Assuming that the wires have the same length and the same diameter, explain which of the two wires will have larger resistivity.



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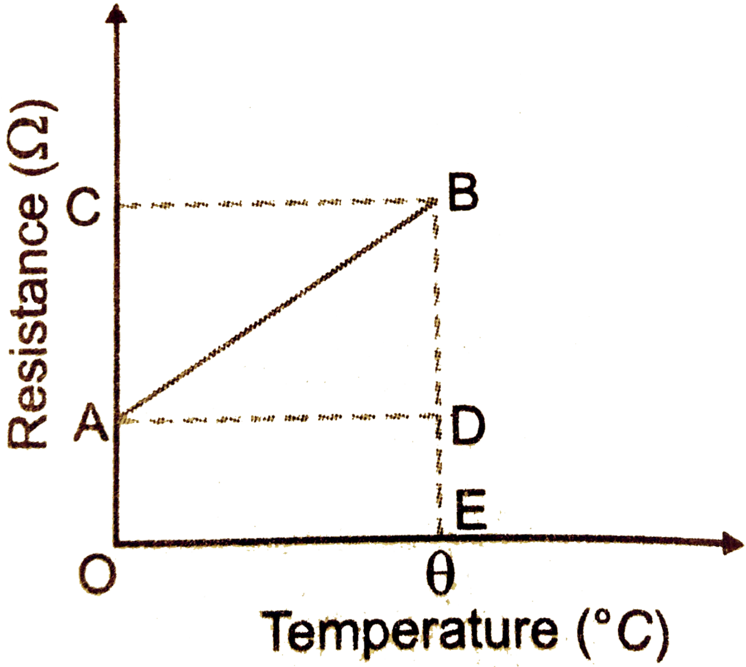
126. The variation of resistance of a metallic conductor with temperature is shown in figure. (i) Calculate the temperature coefficient of resistance from the graph. (ii) State why the resistance of the conductor increases with the rise in temperature.



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127. Is current density a vector or a scalar quantity ? Deduce the relation between current density and potential difference across a current carrying conductor of length l, area of cross-section A, and number density of free electrons n. How does the current density, in a conductor vary with (a) increases in potential gradient ? (b) increase in temperature? (c) increase in length? (d) increase in area of cross-section? (Assume that the other factors remain constant in each case).

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128. Explain why bending a wire does not affect its electrical resistance?

Watch Video Solution

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

Watch Video Solution

130. A copper wire of length l and r radius r is nickel plated till its final radius is 2r. If the resistivity of the copper and nickel are ρ_c and ρ_n, then find the equivalent resistance of the wire.

Watch Video Solution

131. Give relation between drift velocity and electric field.

Watch Video Solution

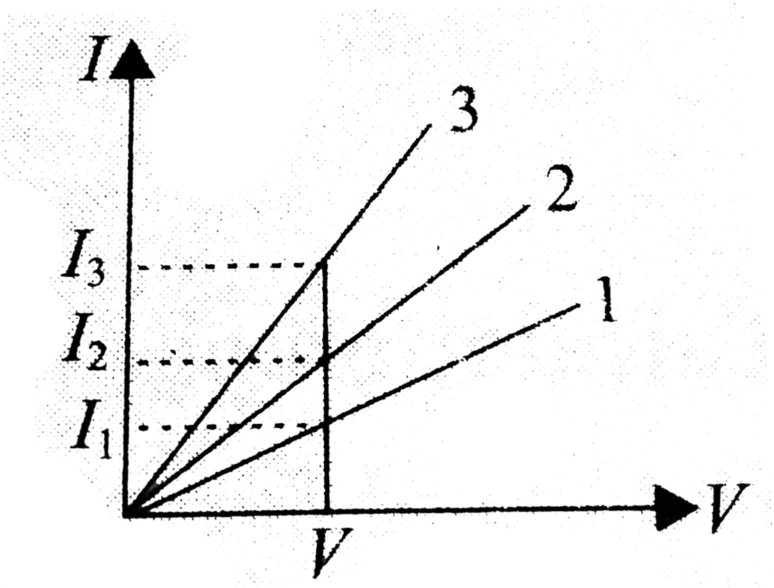
132. A steady current is flowing in a cylindrical conductor. Is there any electric field within the conductor ? If yes, what is its relation with current density?

Watch Video Solution

133. A uniform wire is cut 10 segments increasing in length in equal steps. The resistance of shortest segment is R and the resistance of the other segments increases in steps of 4Ω. If the resistance of the longest segment is 2R, find the value of R and the resistance of original wire.

Watch Video Solution

134. The V - I graphs for two resistors and their series combination are shown in Fig 5.23. Which one of these graphs represents the series combination of the two resistors? Given reason for your answer.



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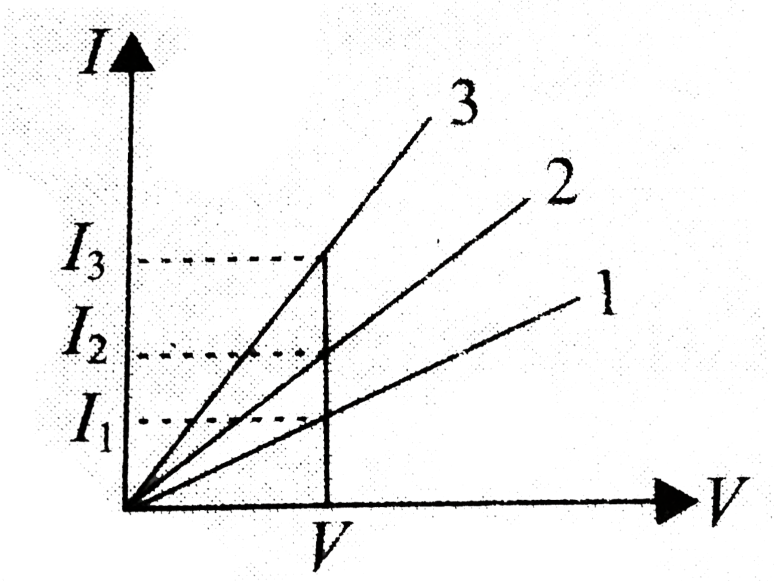
135. The V - I graphs for two resistors and their series combination are shown in Fig 5.23. Which one of these graphs represents the series combination of the two resistors? Given reason for your answer.



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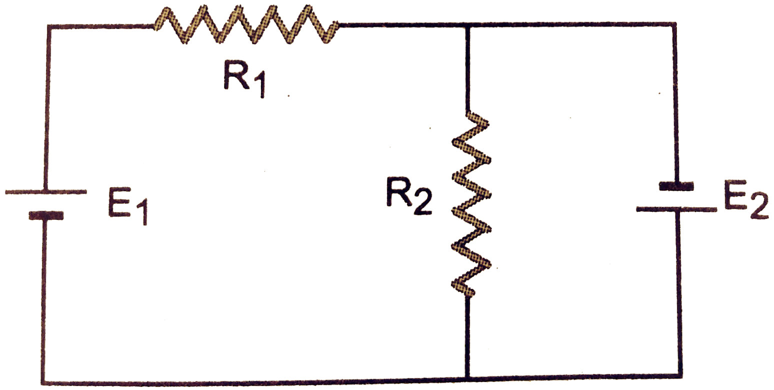
136. Two resistance R_1 and R_2 are joined as shown in figure to two batteries of emf E_1 and

E_2. If E_2 is short circuited, what is the current through R_1 ?



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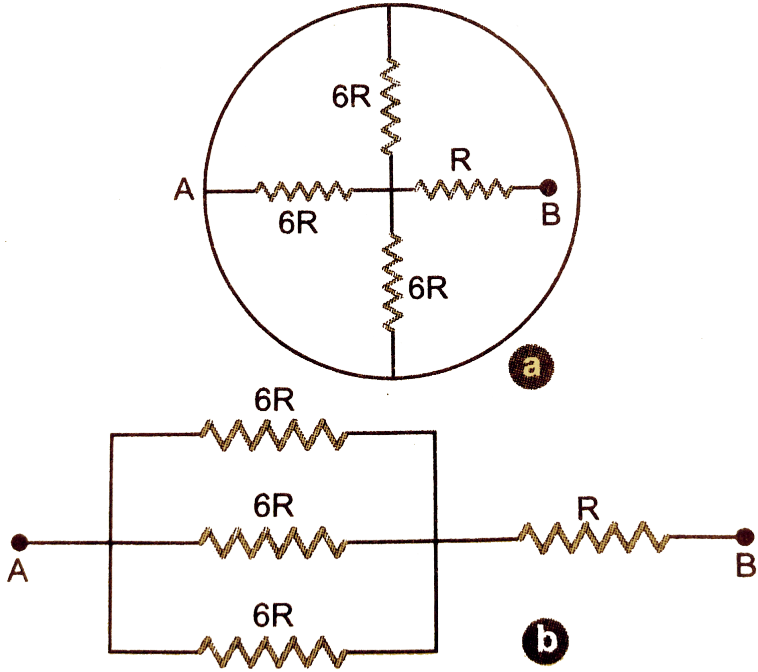
137. In the network shown in figure, the ring has zero resistance. Find the resistance between A and B.



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138. G_1, G_2, G_3 are the conductances of three conductors. What will be their equivalent conductance when they are connected, (i) in series (ii) in parallel.

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139. When we switch on the lights one after the other, what is the effect on the resistance of the electric circuit of the house ? On the current flowing in the main circuit?

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140. $2A$ 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

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141. A battery has an emf E and internal resistance r. A variable resistance R is connected across the terminals of the battery. Find the value of R such that (a) the current in the circuit id maximum (b) the potential difference across the terminals is maximum.

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142. A number of indentical cells, n, each of emf ε, internal resistance r, connected in series are charged by a d.c. source of emf ε', using a resistor R.(i) Draw the circuit arrangemnet. (ii) Deduce the expression for (a) the charging current and (b) the potential difference across the combination of the cells

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143. In which respect, does a nearly discharged lead acid secondary cell differ mainly from a freshly charged cell in its emf or in its internal resistance ?

Watch Video Solution

144. Why do the free electrons in a metal wire, flowing by themselves, not cause any current flow in the wire

Watch Video Solution

145. Is electric current a vector or scalar quantity ? Explain

Watch Video Solution

146. If the elctric current is passed through a nerve, the man is excited, why?

Watch Video Solution

147. When a steady current passes through a cylindrical conductor, is there an electric field inside the conductor?

Watch Video Solution

148. How can you keep a constant current inside a conductor?

Watch Video Solution

149. How does the drift velocity of electrons in a metal conductor vary with the increase in temperature?

Watch Video Solution

150. If the temperature of a good conductor increases, how does the relaxation time of electrons in the conductor change?

Watch Video Solution

151. Two different wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires .

Watch Video Solution

152. Why are copper wires used as connected wires ?

Watch Video Solution

153. The current i flows in a wire of circular cross-section with the free electrons travelling with a drift velocity v. What is the drift velocity of electrons when a current of 2 i flows in another wire of twice the radius and of the same material ?

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154. Define the term 'resistivity' and 'conductivity and state their SI units. Draw a graph showing the variation of resistivity with temperature for a typical semiconductor.

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155. Two conducting wires X and Y of diameter ratio 2 :1 but different materials are joined in series across a battery. If number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires.

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156. A potential difference V is aplied across a conductor of length l. How is the drift velocity affected when V is doubled and l is halved ?

Watch Video Solution

157. Define the term 'drift velocity' of charge carriers in a conductor and wire its relationship with the current flowing through it.

Watch Video Solution

158. What should be the properties of standard resistances?

Watch Video Solution

159. What are the materials generally used for making standard resistance? Give their compositions .

Watch Video Solution

160. Specific resistance of copper, silver and constantan are $(1.78 \times 10^{-6} \Omega cm, 10^{-6} \Omega cm \text{ and } 48 \times 10^{-6} \Omega cm$) respectively. Which is the best conductor and why?

Watch Video Solution

161. What are non-ohmic devices ? Give exmples.

Watch Video Solution

162. Name three materials whose resistivity decreases with rise in temperature .

Watch Video Solution

163. Is the formula $V = IR$ true for non ohmic device also?

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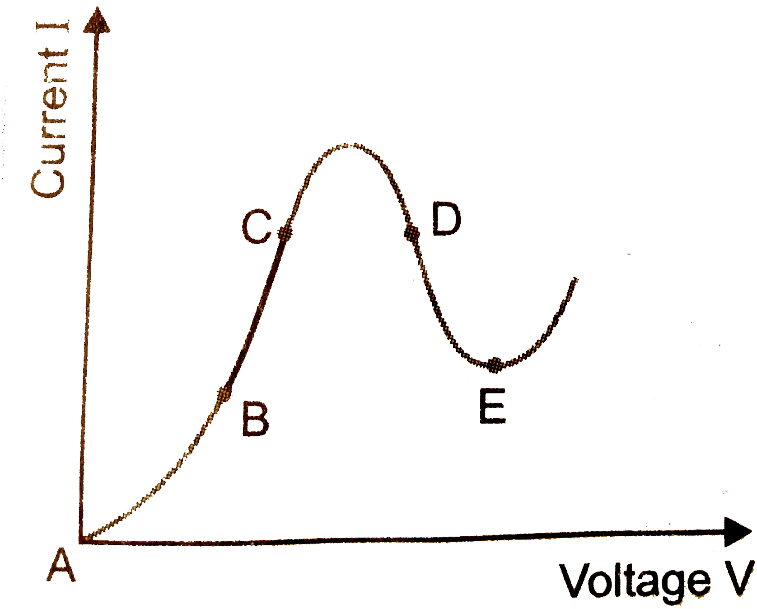
164. Graph showing the variation of current versus voltage for a material GaAs is shown in figure. Identify the region of (i) negative resistance (ii) where Ohm's law is obeyed.



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165. A 4Ω non insulated resistance wire is bent in the middle by 180° and both the halves are twisted with each other. What will be its new resistance ?

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166. Two wires of equal length one of copper and other of manganin have the same resistance. Which wire is thicker?

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167. The current flowing through a conductor is 2 mA at 50V and 3 mA at 60V. Is it an ohmic or nonohmic conductor ?

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168. If the current supplied to a variable resistor is constant, draw a graph between voltage and resistance

Watch Video Solution

169. It is easier to start a car engine on a warm day than on a chilly day. Why?

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Watch Video Solution

170. What is the order of magnitude of the resistnace of a (dry) human body?

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171. If potential difference V applied caross a condutor is increased by 2 V, how will the drift velocity of the electrons change ?

Watch Video Solution

172. Alloys of metals have greater resistivity than that of their constituent metals. Why?

Watch Video Solution

173. Define the term 'mobility' of charge carriers. Write its S.I. unit.

Watch Video Solution

174. What is the resistance of carbon resistor on which the colour of rings in sequence is black, brown,, black and gold.

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175. What will be the bands of colours in sequence on carbon resistor, if its resistance is $0.1\Omega \pm 5\%$.

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

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177. What is the most proable cause of super-conductivity?

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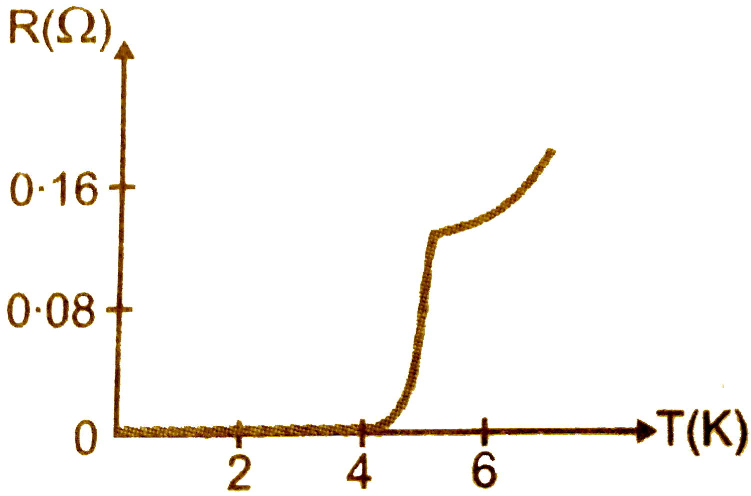
178. The given graph shows the variation of resistance of mercury in the temperature range 0 lt T lt 4 K. Name the phenomeon shown by the graph.



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179. What are the conditions required for making a conductor as a supper conductor?

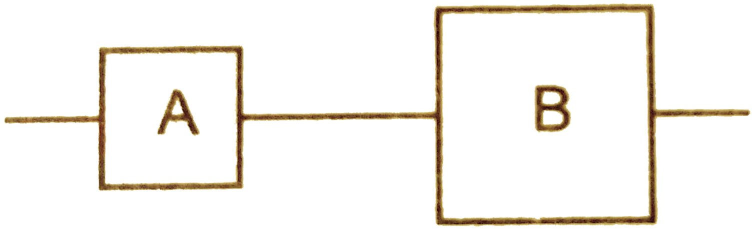
Watch Video Solution

180. Of metals and alloys, which has greater value of temperature co-efficient of resistance ?

Watch Video Solution

181. Two square metal paltes are of same thichness and material. The side of B is twice that of A. Thses are connected in series, figure. If the resistance of A and B are denoted by R_A and R_B

, find R_A / R_B.



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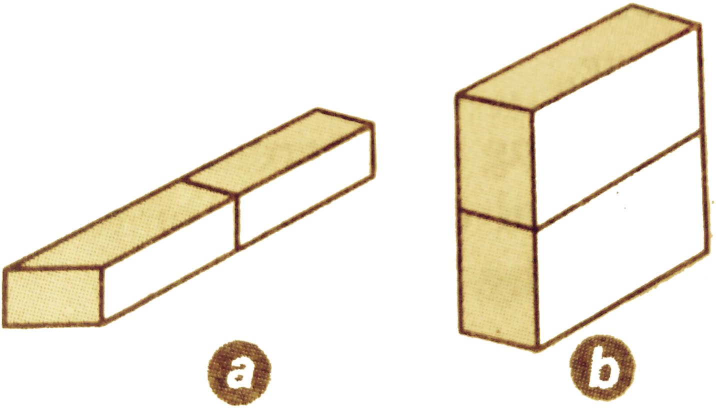
182. Two identical slabs of given metal are joined together in two different ways as shown in figure. What is the ratio of the resistance of these two combinations?



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183. Why is resistance more in series combination of resistors ?

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184. Why is resistance less in parallel combination of resistors ?

Watch Video Solution

185. How will you join three resistances, each of 2Ω so that the effective resistance is 3Ω ?

Watch Video Solution

186. What is the difference between electromotive force and terminal voltage of a cell? How are they related with each other.

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187. What is the internal resistance of a cell due to?

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188. On increasing the current drawn from a cell, the potential difference of its terminlas is lowered. Why?

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189. Can the terminal potential difference of a cell exceed its e.m.f. ?

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190. A (i) series (ii) parallel combination of two given resistors is connected one by one across a cell. In which case will the terminal potential difference across the cell have higher value?

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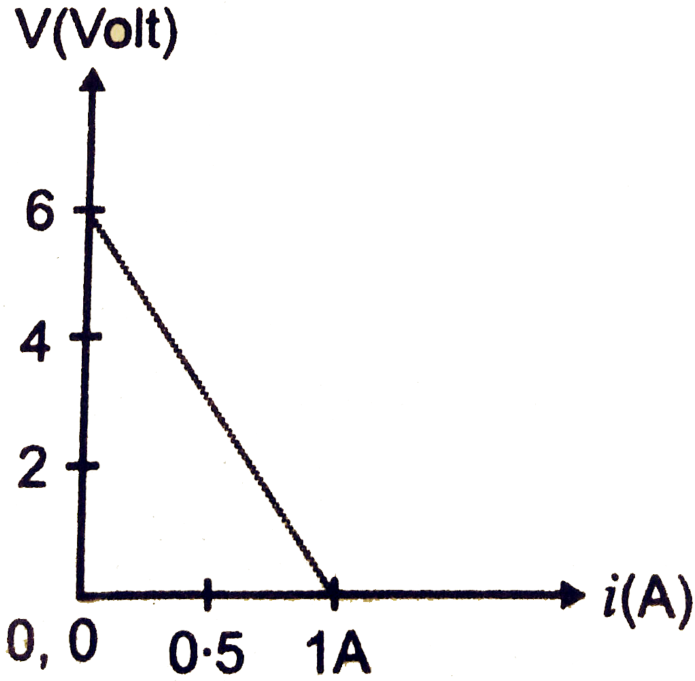
191. Two identical cells each of emf ε, having negligible internal reistance r, are connercted in parallel with each other across an external resistance R. What is the current through this resistance.

Watch Video Solution

192. The plot of the variation of potential difference across a combination of three identical cells in series, versus current is as shown in figure. What is the emf and internal resistance of each cell?



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193. Write any two factors on which internal resistance of a cell depends

Watch Video Solution

194. The car-battery is of 12 volt. 8 simple cells connected in series can give 12 volt. But such cells are not used in starting a car , why ?

Watch Video Solution

195. When cells are connected in parallel, what will be the effect on (i) current capacity (ii)e.m.f. of the cells

Watch Video Solution

196. Is it possible that there is no potential difference between the paltes of a cell ? If yes, under what condition?

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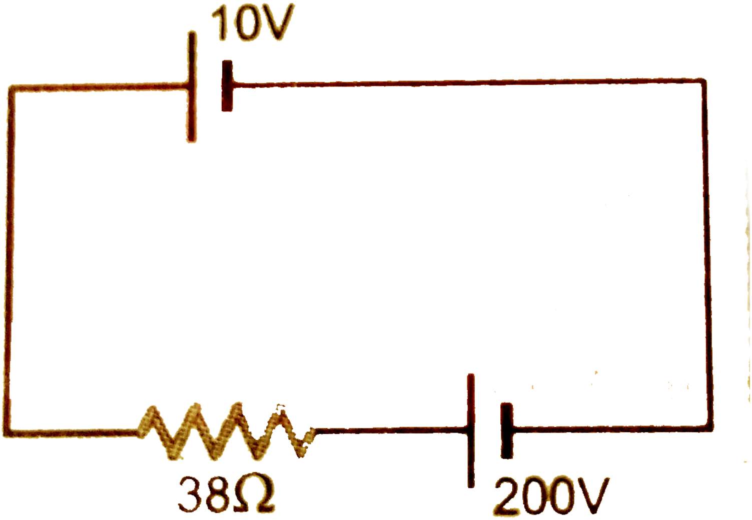
197. A 10 V battery of negilgible internal resistance is connected across a 200V battery and a resistance of $38Oemga$ as shown in figure.



. Find the value of current in the circuit.

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198. A parallel combination of two cells of emfs ε_1 and ε_2, and internal resistance r_1 and r_2 is used to supply current to a load of resistance R. Write the expression for the current through the load in terms of $\varepsilon_1, \varepsilon_2, r_1$ and r_2.

Watch Video Solution

199. How is the current conducted in metals ? Expalin.

Watch Video Solution

200. A conductor of length L is connected to a dc source of emf ε. If this conductor is replaced by another conductor of same material and same area of cross-section but of length 3L, how will the drift velocity change?

Watch Video Solution

201. If the current flowing in a copper wire be allowed to flow in another copper wire of same length but of doubled the radius, then what will be the effect on the drift velocity of the electrons. If the same current be allowed to flow in an iron wire of the same thickness, then ?

Watch Video Solution

202. Write the mathematical relation between mobility and drift velocity of charge carriers in a coductor. Name the mobile charge carriers responsible for conduction of electric current in (a) an electrolyte (b) an ionised gas.

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203. If the resistance of our body is so large ($\approx 10 K\Omega$) why does one experience a strong shock when one accidentaly touches the line wire, say 240 volt supply?

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204. There is an impression among many people that a person touching a high power line gets stuck with the line. Is that true ? Expalin.

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205. Currents of the order of 0.1A through the human body are fatal. What causes the death: heating of the body due to electric current or something else?

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206. Draw V - I graph for ohmic and non-ohmic materials. Give one example for each.

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207. While making a standard resistance. The coil is made of maganin. The coil is doubled folded and is wound over non- conducting frame.Why?

Watch Video Solution

208. The V - I graph for a conductor makes angle θ with V-axis. Here V denotes voltage and I denotes current. What is the resistance of this conductor?

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209. Define the term 'resistivity' and 'conductivity and state their SI units. Draw a graph showing the variation of resistivity with temperature for a typical semiconductor.

Watch Video Solution

210. Define the term 'temperature coefficient of resistivity' . Write its S.I. unit. Plot a graph showing the variation of resistivity of copper with temperature.

Watch Video Solution

211. Explain how electron mobility changes for a good conductor, when (i) the temperature of the conductor is decrased at constant potential difference and (ii) applied potential difference is doubled at constant temperature.

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212. Two wires A and B are formed from the same material with same mass. Diameter of wire A is half of diameter of wire B. If the resistance of wire A is 32Ω, find the resistance of wire B.

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213. A wire is drawn into double its length and half its original cross-section. What will be increase in its (i) resistance and (ii) resistivity?

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214. Two students A and B were asked to pick a resistor of $15k\Omega$ from a collection of carbon resistors. A picked a resistor with bands of colour: brown, green, orange while B choose a resistor with bands black, green, red. Who picked the correct resistor? Explain.

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215. A current of 2 mA is passed through a colour coded carbon resistor with first, second and third rings of yellow, green and orange colours. What is the voltage drop across the resistor?

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216. What are thermistors? Explain their use in brief.

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217. Thermistors differ ordinary resistors. Explain.

Watch Video Solution

218. What are super-conductors? Write their two applications.

Watch Video Solution

219. A carbon filament has resistance of 120Ω at $0^\circ C$ what must be te resistance of a copper filament connected in series with resistance and combined resistance remained constant at all temperature

$$\left(\alpha_{\text{carbon}} = \frac{-5 \times 10^{-4}}{\hat{}\ (\circ)C}\right), \alpha_{\text{copper}} = \frac{4 \times 10^{-3}}{\hat{}\ (C))}$$

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220. A uniform wire is cut into four segments. Each segment is twice as long as the earlier segment. If the shortest segment has a resistance of 2Ω, find the resistance of original wire.

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221. Why is it uniform to turn a light switch on or off while taking bath ?

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222. Lights of a car become dim when the starter is opereterd. Why?

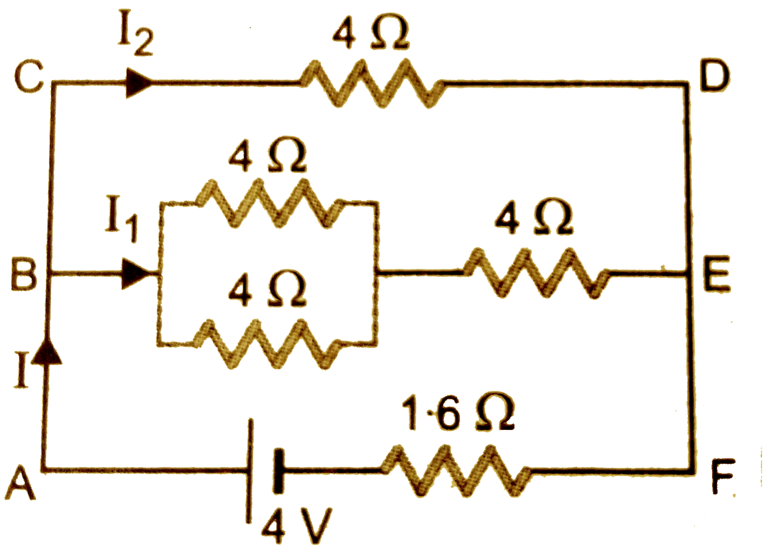
Watch Video Solution

223. To reduce the brightness of a light bulb, should an auxiliary resistance be connected in series with it or in parallel?

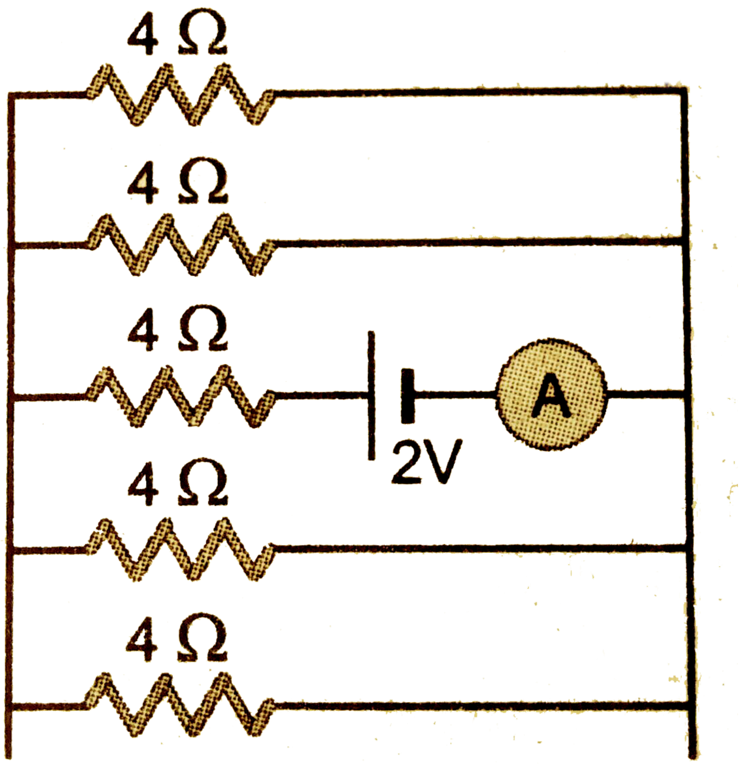
Watch Video Solution

224. An electric current is passed through a circuit containing two wires of the same material connected in parallel. If the length and radii of the wires are in the ratio $2/3$ and $4/3$, then find the ratio of the current passing through the wires

225. Find the value of current I_1.



226. Five 4Ω resistance, 2 V battery and an ammeter are connected as shown in figure. Find the ammeter reading.



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227. At $0^\circ C$ the resistance of conductor of a conductor B is n times that of condoctor A temperature coefficient of resistance for A and B are α_1 and α_2 respectively the temperature coefficient of resistance of a circiut segment constant A and B in series is

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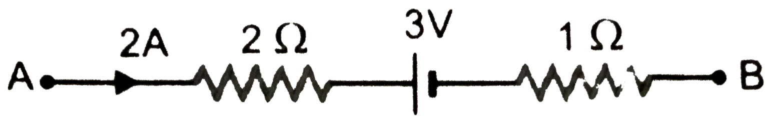
228. Figure represents a part of closed circuit. What is the potential differnce between points A and B?



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229. What is terminal potential differnce of a cell? Can its value be greater than the emf of a cell? Explian.

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230. A car has a fresh storage battery of emf 12 V and internal resistance $5.0 \times 10^{-2} \Omega$. If the starter motor draws a current of 90A, what is the terminal voltage of the battery when the starter is on?

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231. After long use of car, as given in question 33, the internal resistance of the storage battery increases to 500Ω. What maximum current can be drawn from the battery ? Assume the emf of the battery to remain unchanged.

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232. In Ques. 34, if the discharged battery is charged by an external emf sourece, is the terminal voltage of the battery during charging greater of smaller than its emf 12 V?

Watch Video Solution

233. Three identical cells each of 2 V and unknow internal resistance are connected in parallel. This combination is connected to a 5 ohm resistor. IF the terminal voltage across the cell is 1.5 volt, what is the internal resistance of each cell?

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234. 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.

Watch Video Solution

235. Under what conditions will the strength of current in a wire will be the same for connections in series and in parallel of n indentical cells?

Watch Video Solution

236. A cell of emf ε and internal resistance r is connected across a variable resistor R. Plot a graph showing variation of terminal voltage V of the cell versus the current I. Using the plot, show

how the emf of the cell and its internal resistance can be determined.

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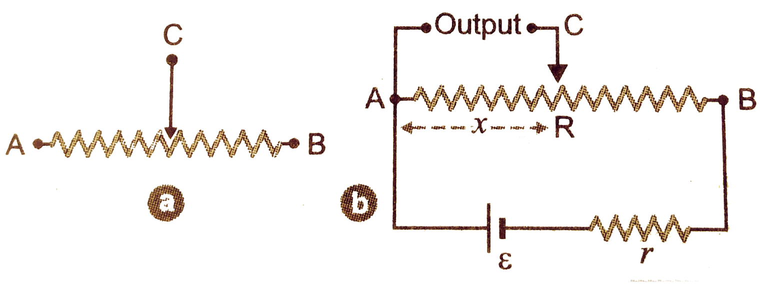
237. A schematic rheostat is shown in figure. Connect a battery to it so that it acts as a potential divider. Also show the output terminals.



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238. For what basic purpose the cells are connected (i) in series (ii) in parallel and (iii) in mixed grouping?

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239. What do you understand by electric current? Define its S.I. unit and mention the direction of electric current in the circuit. Also expalin if current is a scalar or vector quantity.

Watch Video Solution

240. Derive an expression for drift velocity of electrons in a conductor. Hence deduce ohm's law.

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241. What is drift velocity? Establish a relation between current and drift velocity?

Watch Video Solution

242. State Ohm' law and deduce it from the knowledge of drift velocity of free electrons in a conductor carrying current.

Watch Video Solution

243. What do you understand by resistance of a conductor ? Define its SI unit. Show that resistance of a conductor is given by $R = \frac{ml}{ne^2\tau A}$, where the symbols have their usual meanings.

Watch Video Solution

244. Define relaxation time of the free electrons drifting in a conductor. Establish a relation between drift. Velocity and time of relaxation. Use this relation to deduce the expression for the electrical resistivity of the material.

Watch Video Solution

245. Define resistance of a conductor. What is its cause? Explain the factors on which the resistance of a conductor depends.

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246. Explain current density, conductance and electrical conductivity. State their SI units.

Watch Video Solution

247. Define the term 'resistivity' and 'conductivity and state their SI units. Draw a graph showing the variation of resistivity with temperature for a typical semiconductor.

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248. Discuss the effect of temperature on the resistance of (i) metals (ii) semiconductors and (iii) insulators.

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249. What are ohmic and non-ohmic conductors? Explain the super-conductivity.

Watch Video Solution

250. Define the term 'temperature coefficient of resistivity' . Write its S.I. unit. Plot a graph showing the variation of resistivity of copper with temperature.

Watch Video Solution

251. Write the mathematical relation for the resistivity of a material in terms of relaxation time, number density and mass and charge of charge carriers in it.

Explain, using this relation, why the resistivity of the metal increases and that of a semiconductors decreases with rise in temperature.

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252. Explain colour code for carbon resistors with illustrations.

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253. What do you understand by internal resistance and terminal potential difference of a cell? On what factors do they depend?

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254. Establish a relation between E.M.F. and potential difference of a cell.

Watch Video Solution

255. Define relaxation time of the free electrons drifting in a conductor. Establish a relation between drift. Velocity and time of relaxation. Use this relation to deduce the expression for the electrical resistivity of the material.

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256. Derive an expression for drift velocity of electrons in a conductor. Hence deduce ohm's law.

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257. Derive the expression for the current density of a conductor in terms of the conductivity and applied electic field. Explain with reason how the mobility of electrons in a conductor changes when the potential difference applied is doubled, keeping the temperature of the conductor constant.

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258. Define resistivity of the material. State its SI unit and discuss its variation with temperature in case of (i) metals (ii) semiconductors and (iii) insulators.

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259. Find the total resistance when the various resistors are connected (i) in series and (ii) in parallel.

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260. What do you understand by internal resistance and terminal potential difference of a cell? On what factors do they depend?

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261. Discuss the grouping of two unidentical cells in(i) series and (ii) parallel and find their equivalent emf and internal resistance.

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262. Explain the various types of gruoping of identical cells and find the condition for the maximum current in the external resistors connected to the combination of cells (i) in series (ii) in parallel and (iii) in mixed grouping.

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263. Do you know the blological connection of resistance and current to the human body?

Watch Video Solution

264. How does the concept of change of resistance of a wire when strained (stretched) has been utilized in technology?

Watch Video Solution

265. What does the odometer of an automobile measure ?

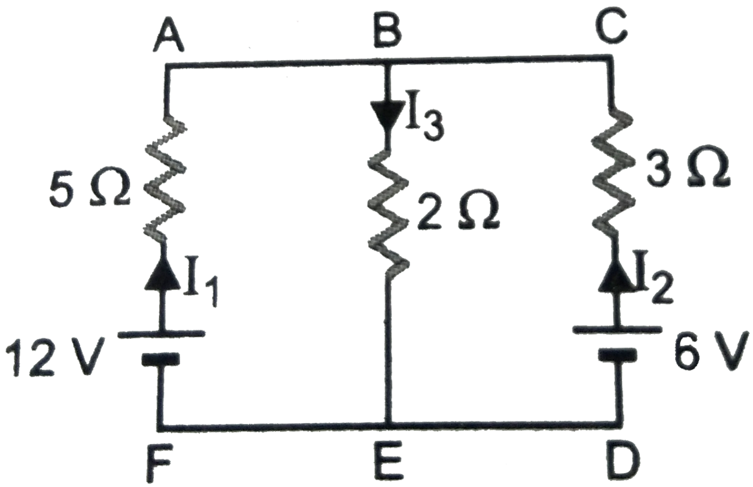
Watch Video Solution

266. Why does Duracell company sell batteries in a package that includes a tester?

Watch Video Solution

267. Using Kirchoff's laws in the electrical net work shown in figure, calculate the values of

I_1, I_2 and I_3.



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268. Two cells of emfs 1.5 V and 2.0V internall resistance 1Ω and 2Ω are connected in parallel so as to send current in the same direction through an external resistance of 5Ω.

(i) Draw the circuit diagram. (ii) Using Kirchhoff's rules, calculate.

(a) current through each branch of the circuit (b) potential difference across the 5Ω resistance.

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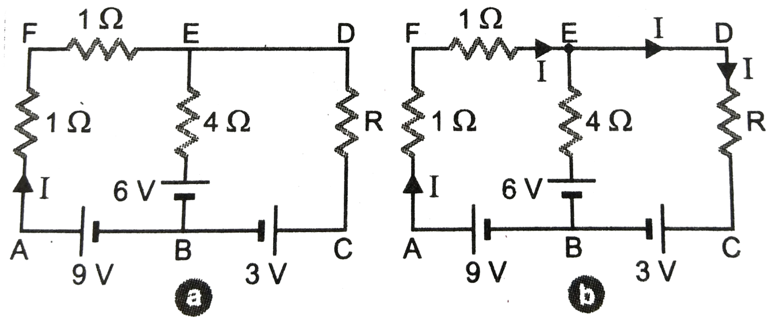
269. Using Kirchoff's rules determine the value of unknown resistance R in the circuit shown in figure, so that no current flows through 4Ω resistance. Also find the potential difference between A and D.



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270. A battery of 6 V internal resistance 0.5Ω is joined in parallel with another of 10 V and internal resistnace 1Ω. The combination sends a current through an external resistance of 12Ω. Find the current through each battery.

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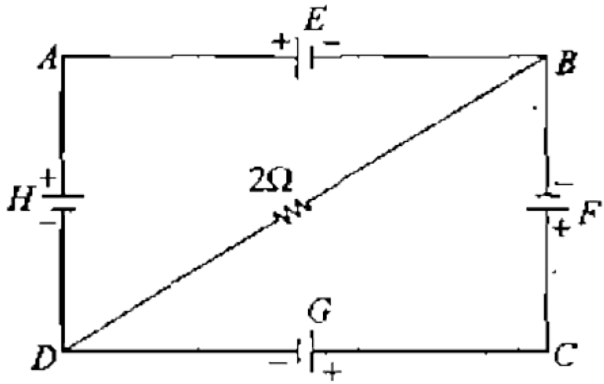
271. In the circuit shown in figure-3.159 cells E,F,G and H are of EMF 2V, 1V,3V and 1V respepitly and their internal resitance are 2Ω, 1Ω, 3Ω and 1Ω respectively Calculate

(a) The potential difference between points B and D

(d) The potential difference across the terminals of the cell G and H.



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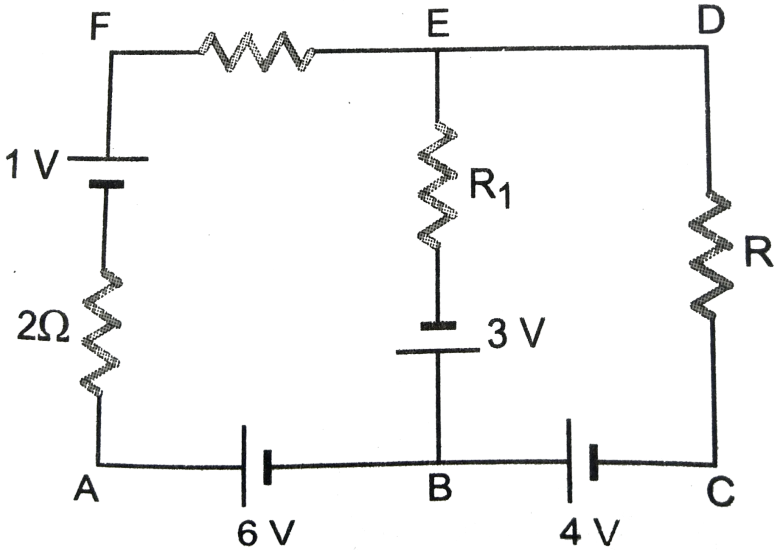
272. Use Kirchhoff's rules to determine the potential differnce between the poits A and D when no current flows in the arm BE of the electric network shown in figure



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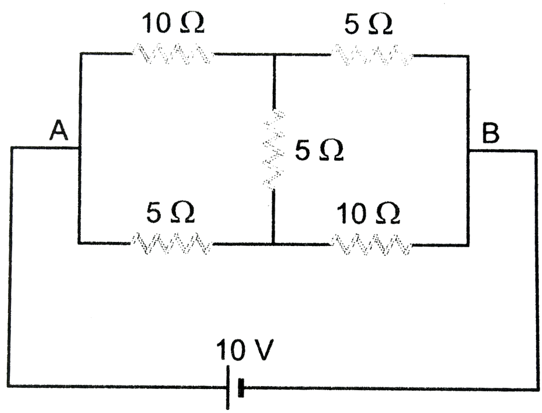
273. Calculate the equivalent resistance between the points A and B of the network shown in figure

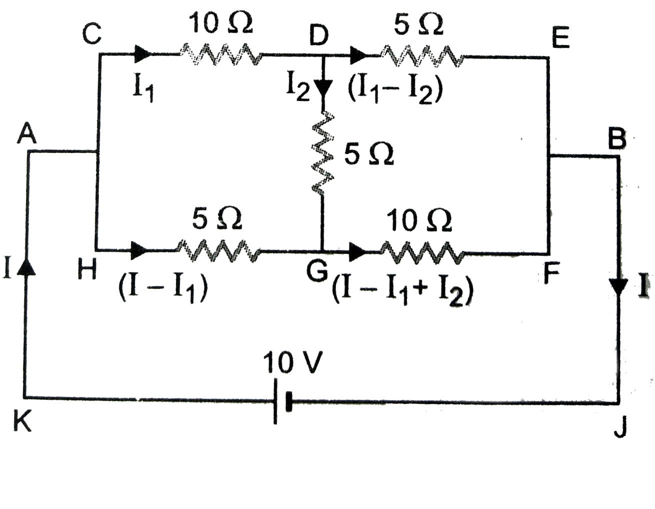
Watch Video Solution

274. Calculate the current in the various branches of 10Ω resistance of the network of resistance as shown in figure

(a)



(b)



Also calculate the total resistance between A and B.

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275. Two cells of emfs 1.5 V and 2.0V internal resistance 2Ω and 1Ω respectively have their negative terminals joined by a wire of 6Ω and positive terminals by another wire of 4Ω. A third wire of 8Ω connects the mid points of these two wires. Find the current through 8Ω and the potential difference at the ends of the third wire.

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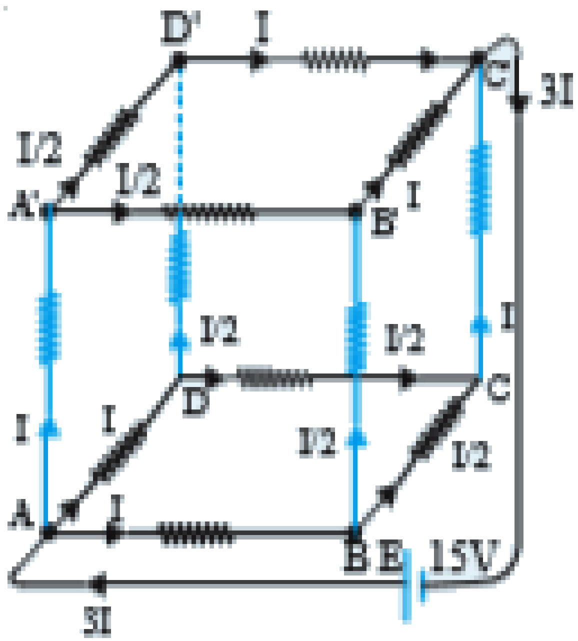
276. A battery of 15 V and negligible internal resistance is connected across the diagonally opposite corners of a cubical network consisting of 12 resistors each of resistance 5Ω 22. Determine the equivalent resistance of the network and the current along each edge of the cube.



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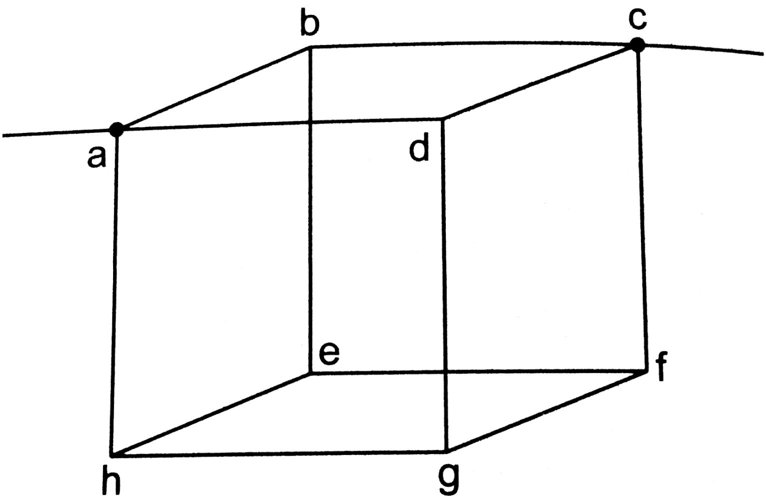
277. Twelve wire, each having resistance r, are joined to form a cube as shown in figure.Find the equivalent resistance between the end of a face diagonal such as a and c.



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278. Eleven equal wires each of resistance r form the edges of a incomplete cube. Find the total resistance from one end of the vacant edge of the cube to the other.

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279. Determine current in each branch of the network shown in figure

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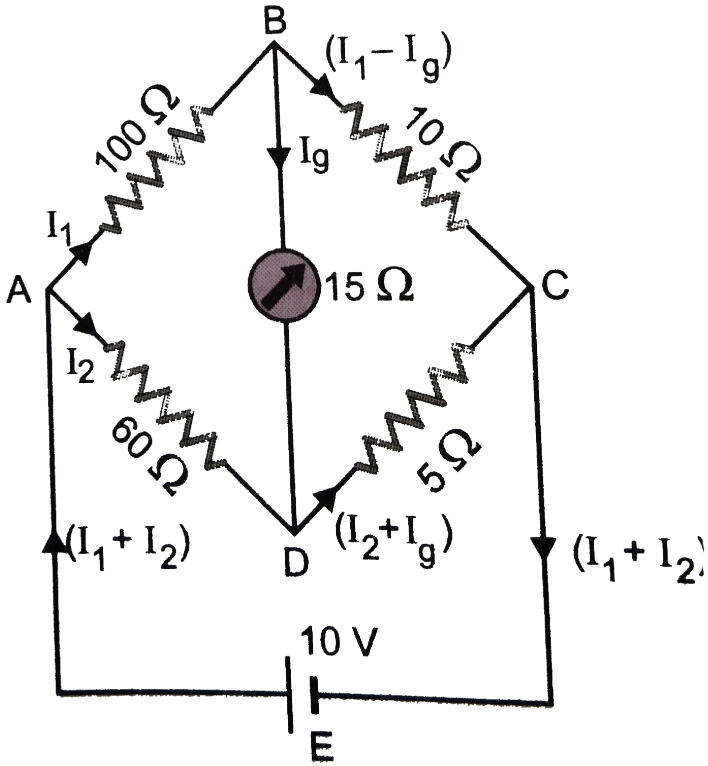
280. The wheat stone bridge circuit have the resistance in various arms as shown in figure.

Calculate the current through the galvanometer.



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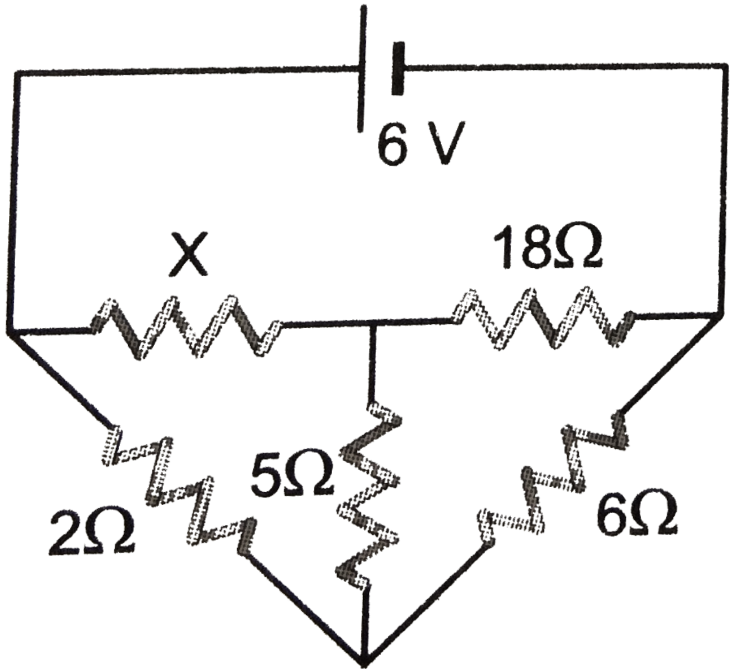
281. Find out the magnitude of resistance X in the circuit shown in figure, When no current flows through the 5Ω resistance



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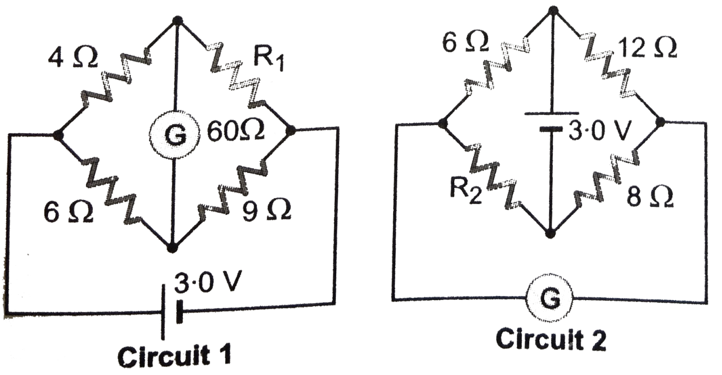
282. The galvanometer, in each of the two given circuits does not show any deflection. Find the ratio of the resistors R_1 and R_2 used in these two circuits.



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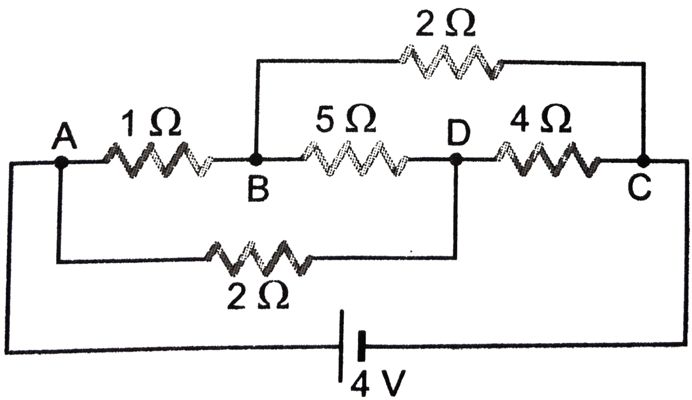
283. Calculate the current the current drawn from the battery by the network of resistors shown in figure.



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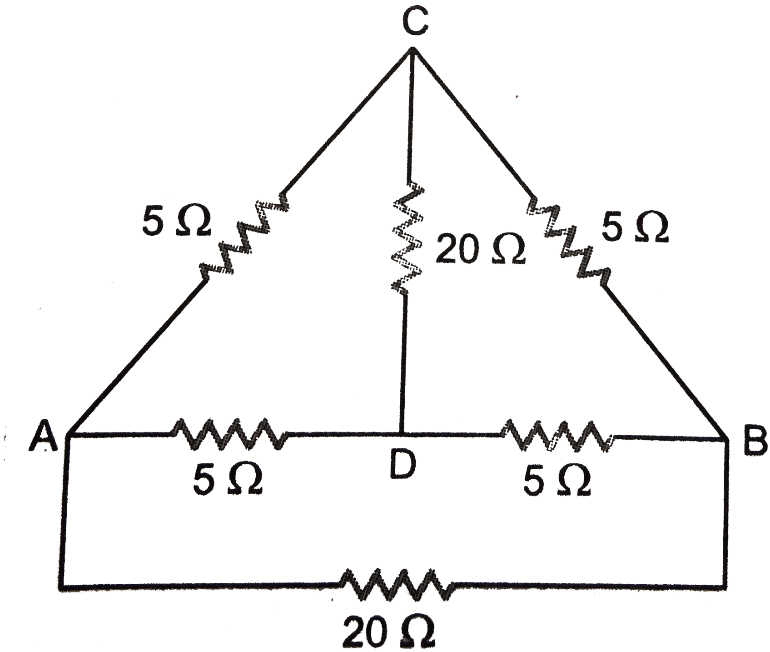
284. Calculate the resistance between the points A and B of the networks shown in figure



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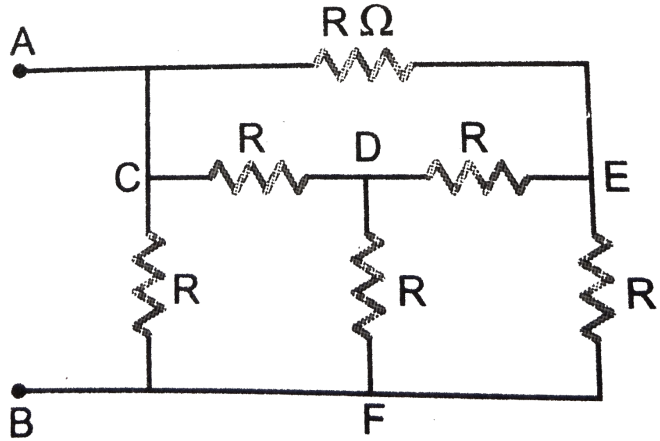
285. Six equal resistors, each of value R are joined together as shown in figure



Calculate the equivalent resistance across AB. If a supply of emf ε is connected across AB, compute the current through the arms DE and AB.

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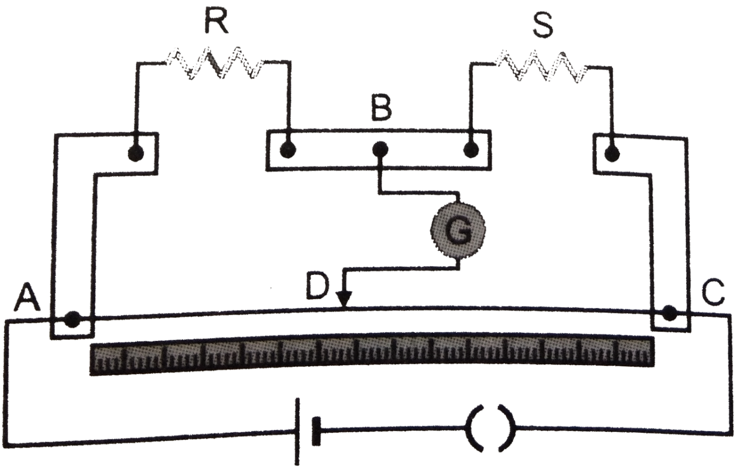
286. In meter bridge, the null points is found at a distance of 60.0 cm front end A. If now a resistance of 5Ω is connected in series with S, the null point occurs at 50 cm. Determine the values of R and S,



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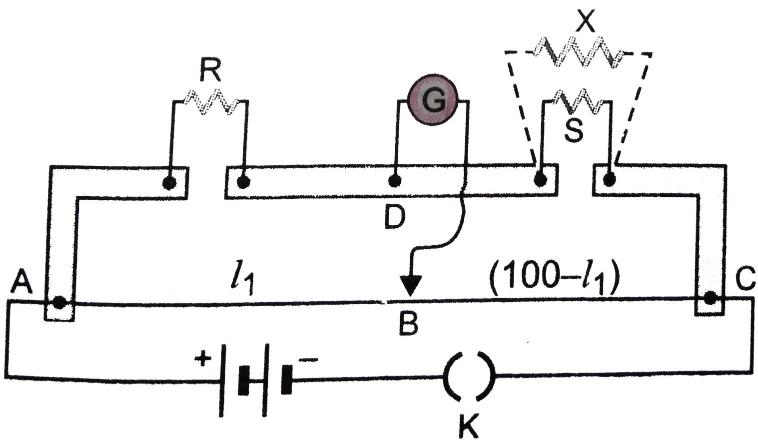
287. When two known resistance R and S are connected in the left and right gaps of a meter bridge, the balance point is found at a distance l_1 from the zero end of the meter bridge wire. An unknown resistance X is now connected in parallel to the resistance S and the balance point is found at a distance l_2 from the zero end of the meter bridge wire,



Obtain a formula for X in terms of l_1, l_2 and S.

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288. Two resistances are connected in the two gaps of a meter bridge. The balance point is $20cm$ from the zero end. When a resistance 15Ω is connected in series with the smaller of two resistance, the null point+ shifts to $40cm$. The smaller of the two resistance has the value.

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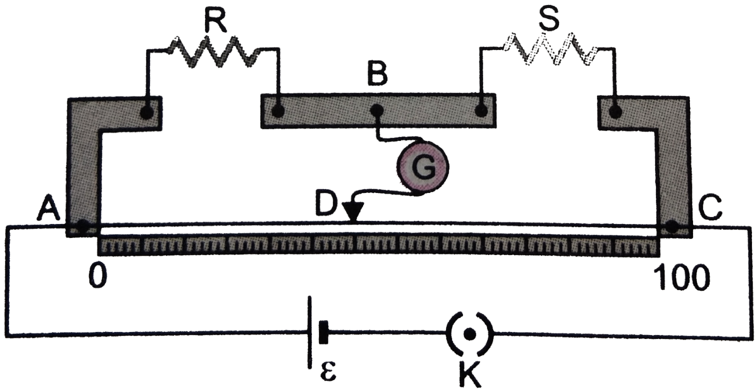
289. In a meter bridge,



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

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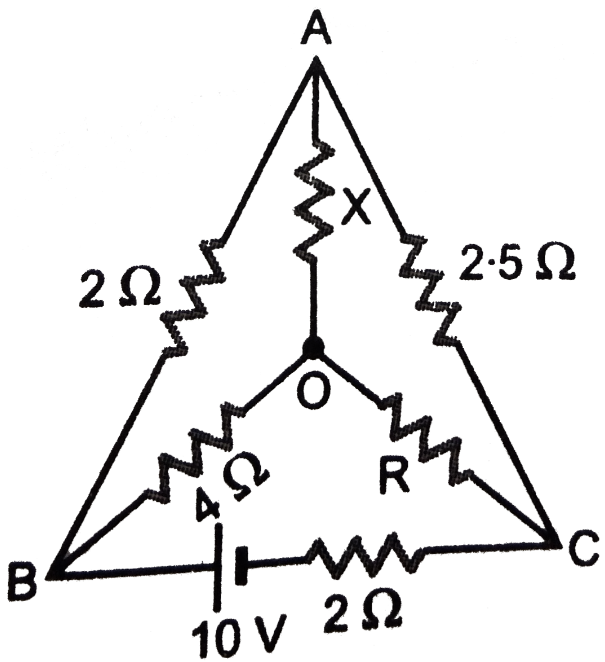
290. For the network shown in figure



Determine the value of R and the current through it, if the current through the branch AO is zero.

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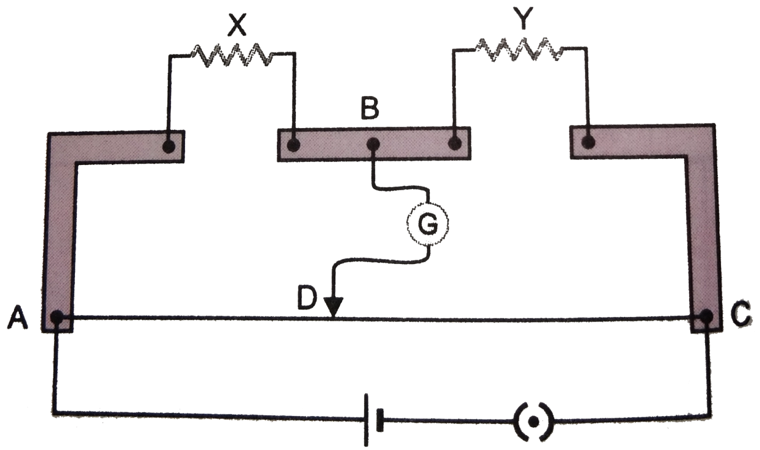
291. The figure



Shows the experimental set up of a meter bridge. The null point is found to be 60 cm away from the end A with X and Y in positions as shown. When a resistance of 15Ω is connected in series with Y, the null points is found to shift by 10 cm towards the end A of the wire. Find the position of the null point if resistance of 30Ω were connected in parallel with Y.

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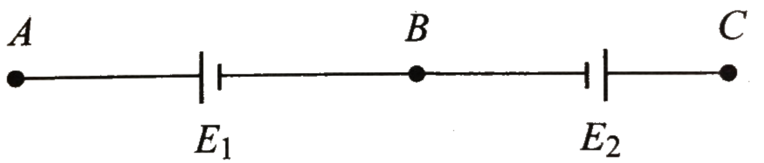
292. Two cells of emfs E_1 and $(E_2(E_1 > E_2)$ are connected as shows in Fig. 6.45.



When a potentiometer is connected between A and B, the balancing length of the potentiometer wire is $300cm$. On connecting the same potentiometer between A and C, the balancing length is $100 cm$. The ratio E_1 / E_2 is

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293. In a potentiometer, a standard cell of emf $5V$ and of negligible resistance maintains a steady current through the galvanometer wire of length $5m$. Two primary cells of emfs ε_1 and ε_2 are joined in series with (i) same polarity and (ii) apposite polarity.The combination is connected through it galvanometer and a joined to the potentiometer. The balancing length is the two cases are found to be $350 cm$ and 50 cm`

respectively

(i) Draw the necessary circuit diagram

(ii) Find the value of emfs of the two cells

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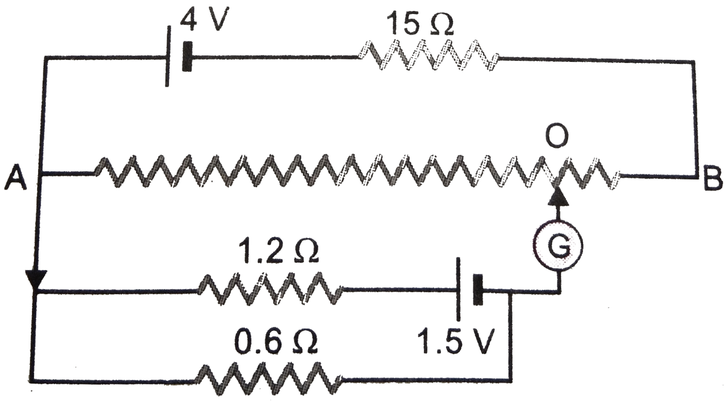
294. AB is 1 meter long uniform wire of 10Ω resistance. Other data are shown in the diagram. Calculate (i) potential gradient along AB (ii) length AO when galvanometer shown deflection



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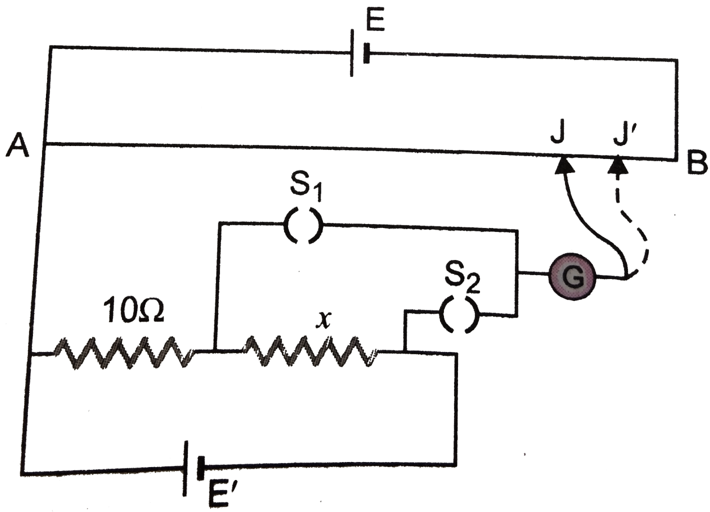
295. In the potentimeter circuit shown in figure, the balance point with $R = 10\Omega$ when switch S_1 is closed and S_2 is open is 50 cm, while that when S_2 is closed and S_1 is open is 60 cm. What is the value of x? What will you do if you fail to find a balance point with the given cell E'?



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296. 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

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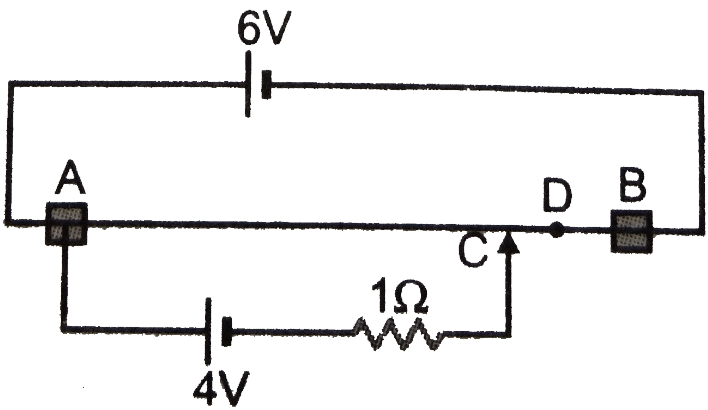
297. A 6 volt battery of negligible internal resistance is connected across a potentiometer wire is AB of length 100 cm and uniform area of cross-section. The posistive terminal of another battery of emf 4 V and internal resistance 1Ω is joined to the point A as shown in figure. If we take potential at B to be zero, (a) What are the potentials at points A and C. (b) At which point D of the potentiometer C? (C) If the points C and D are connected by a wire, What will be the current through itgt (d) if the 4 V battery is replaced by 7.5 V battery, what would be the answers of parts (a) and (b)?



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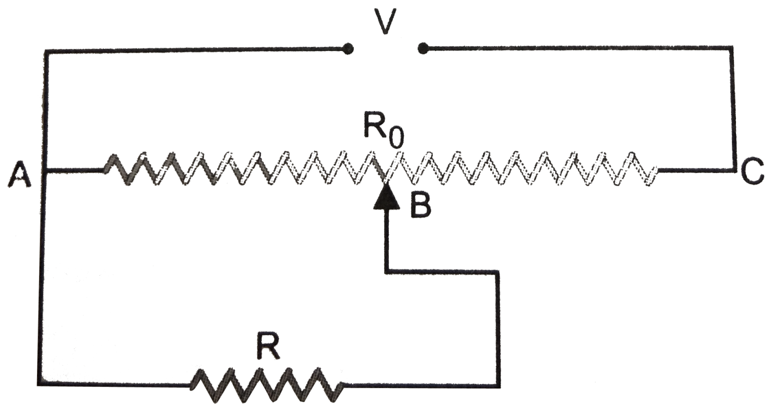
298. A resistance of $R\Omega$ draws current from a potentiometer. The potentiometer has a total resistance $R_0\Omega$. A voltage V is supplied to the potentiometer. Derive an expression for the voltage fed into the circuit when the slide contact is in the middle of potentiometer.



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299. A potentiometer wire of length 1.0 m has a resistance of 15 ohm. It is connected to a 5 V source in series with a resistance of 5Ω.

Determine the emf of the primary cell which has a balance point at 60 cm.

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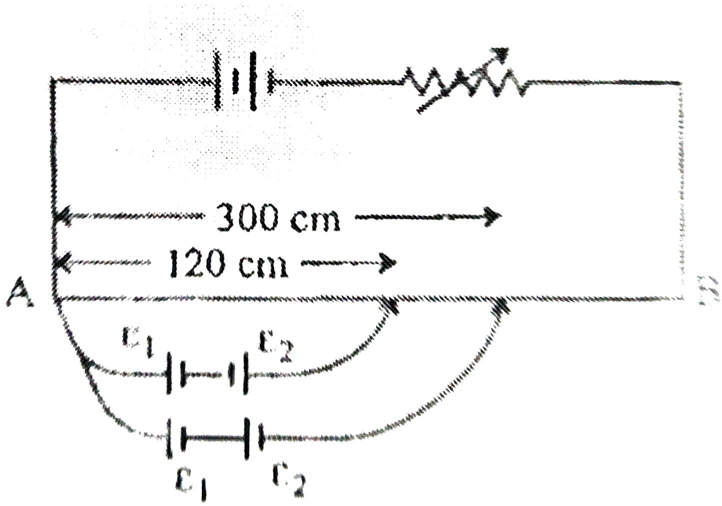
300. In the figure a long uniform potentiometer wire AB is having a constant potential gradient along its length. The null points for the two primary cells of emfs ε_1 and ε_2 connected in the manner shown are obtained at a distance of 120 cm and 300 cm from the end A. Find (i) $\varepsilon_1 / \varepsilon_2$ and (ii) position of null point for the cell ε_1.

How is the sensitivity of a potentiometer increased ?



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301. When a resistor of 5Ω is connected across a cell, its terminal potential differnce is balanced by 140 cm of potentiometer wire and when a resistance of 8Ω is connected across the cell, the terminal potential difference is balanced by 160 cm of the potentiometer wire. Find the internal resistance of the cell.

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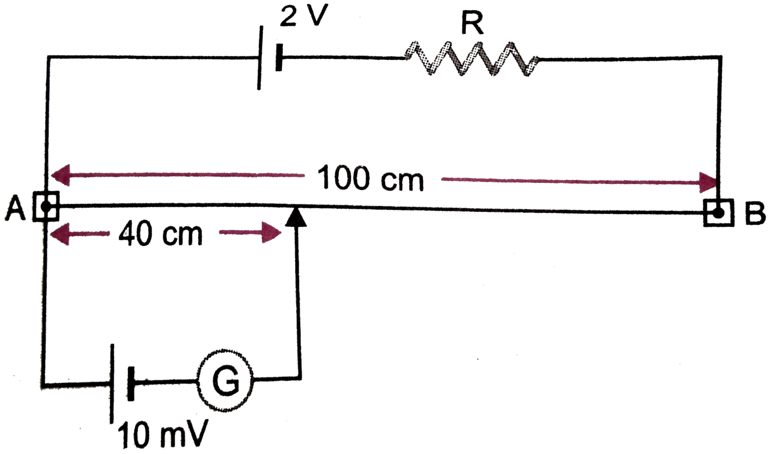
302. A potentiometer wire of length $100 cm$ having a resistance of 10Ω is connected in series with a resistance R and a cell of emf $2V$ of negligible internal resistance. A source of emf



of $10mV$ is balanced against a length of $40cm$ of the potentiometer wire. What is the value of resistance R ?

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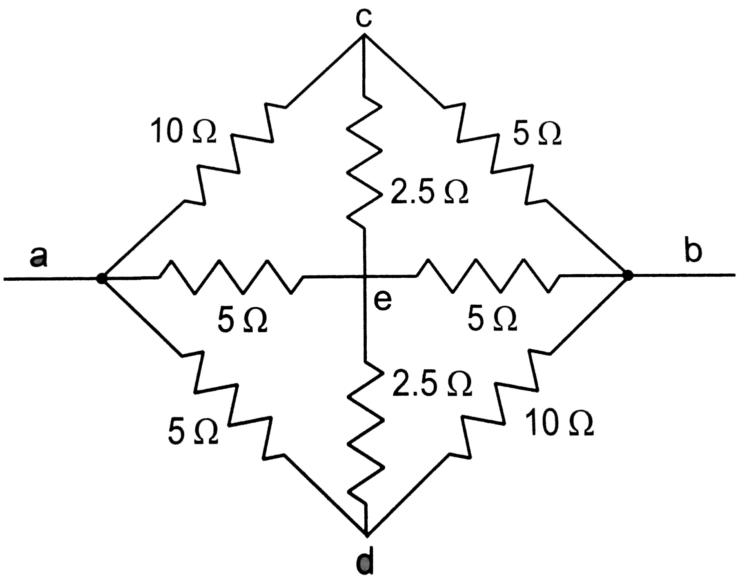
303. Find the equivalent resistance of the network shown in figure between the points

a and b.



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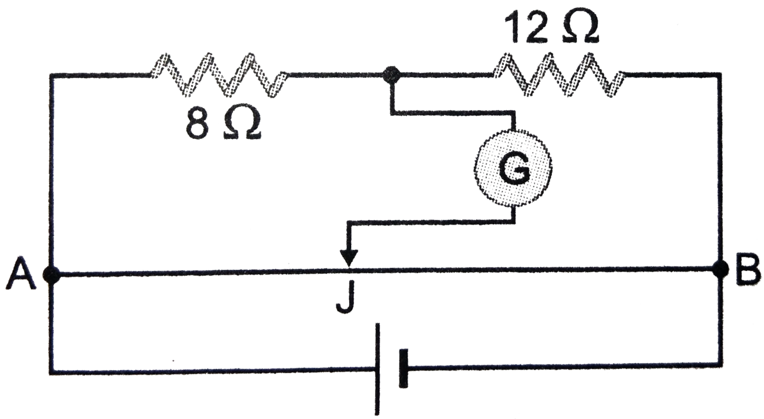
304. The wire AB of slide wire bridge is 400 cm long. Where should the jockey J whose one end connected to galvanometer,the other end can be connected to AB, so that galvanometer shows no deflection ?



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305. Can meter bridge be used for finding the resistance of (i) moderate values (ii) high values (iii) low values ? Explain.

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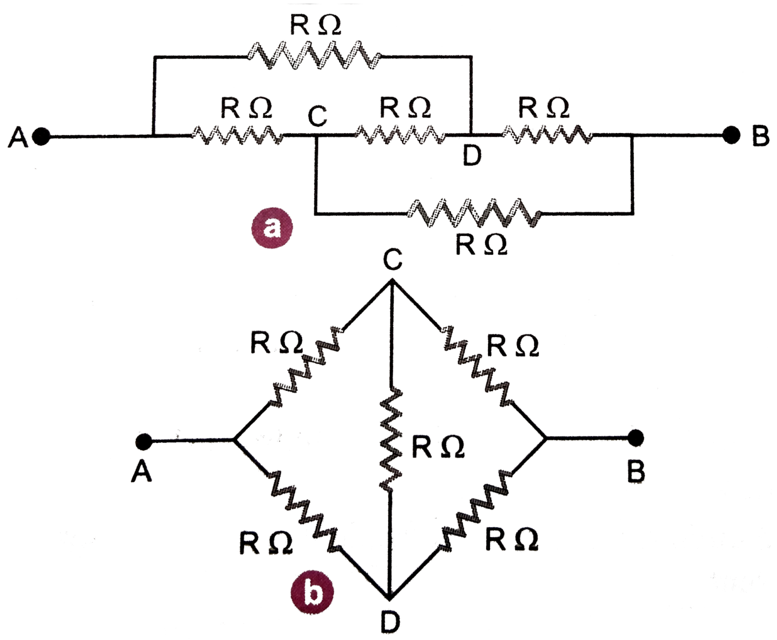
306. Five equal resistors each of $R\Omega$ are connected in a network. Calculate the equivalent resistance between the points A and B.



307. Using meter bridge, it is advised to obtain the null point in the middle of bridge wire. Why?

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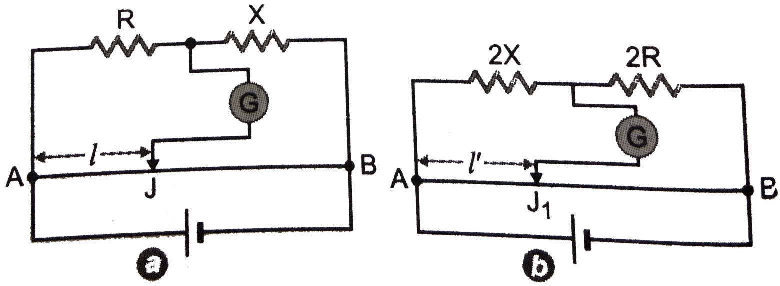
308. In the meter bridge experiment, a student observes a balance point at the point at the point J, where AJ=l. The value of R and X are both doubled and then interchanged. What will be the new position of balance point. If in this set up, the galavanometer and battery are interchange at the balance point position, how will the balance point get affected?



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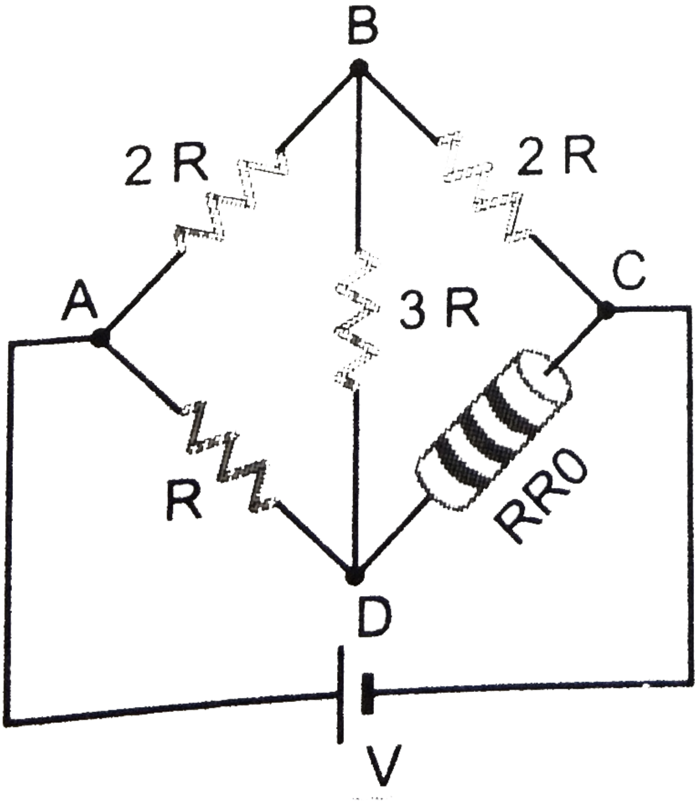
309. In the given Wheatstone bridge, the current in the resistor 3 R is zero. Find the vlaue of R, if the carbon resistor, connected in one arm of the bridge, has the colour sequence of red, red and orange.



The resistance of BC and CD arms are now interchanged and another carbon resistance is connected in place of R so that the current through the arm BD is agian zero. Write the sequence of colours bands of this carbon resistor. Also find the nature of current through it.

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310. The emf of the driver cell in the potentiometer experiment should be greater than the emf of the cell to be determined. Why?

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311. Why do we prefer potentiometer with a longer bridge wire?

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312. What do you understand by sensitiveness of a potentiometer and how can you increase the sensitiveness of a potentiometer?

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313. Can you interchange the positions of the battery in the auxiliary circuit and cell whose emf is to be determined in potentiometer circuit diagram?

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314. On what factors, does the potential gradient of the potentimeter wire depend?

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315. What does the no deflection position in the galvanometer of potentiometer experiment tell us about the flow of current ?

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

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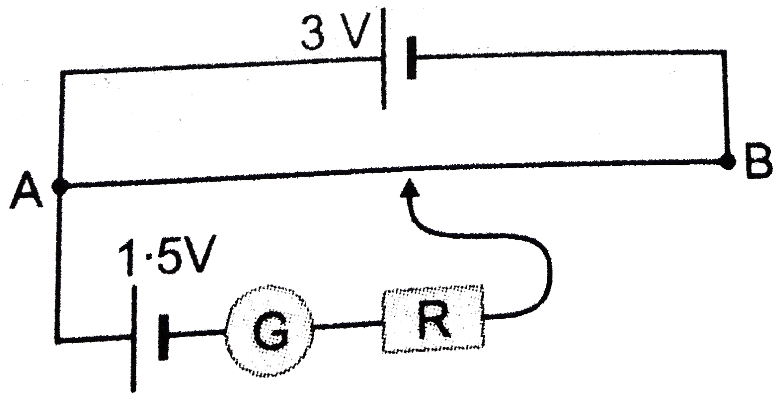
317. A potentiometer wire of length 1 m is connected to a driver cell of emf 3 V. When a cell of emf 1.5V is used in the secondary circuit, the balance points is found to be 60 cm. On replacing this cell with a cell of inknown emf, the balance points shifts to 80 cm.



(i) Calculate unknown emf of the cell. (ii) Explain with reason, whether the circuit works, if the drivere cell is replaced with a cell of emf 1 V. (iii) Does the high resistance R, used in the secondary circuit affect the balance point? Justify your answer.

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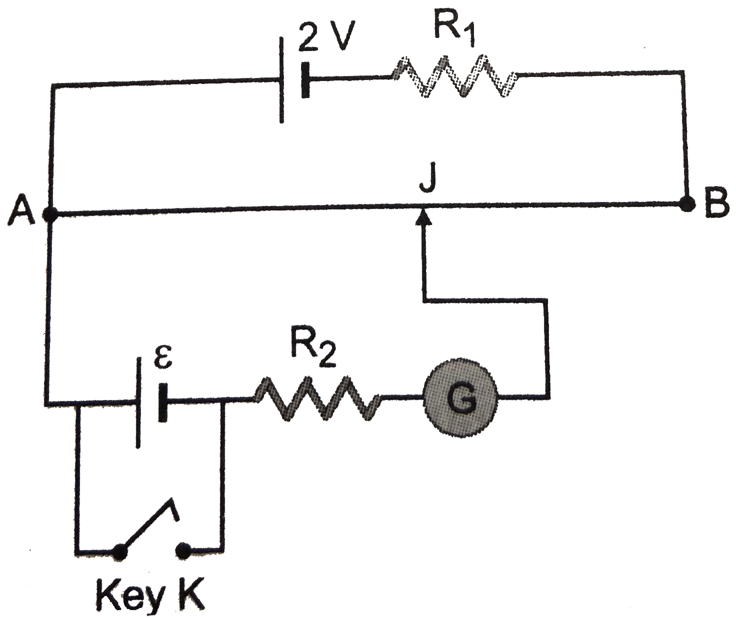
318. The circuit diagram of a potentiometer for determining the emf ε of a cell of negligible internal reistance.

(i) What is the purpose of using high resistance R_2? (ii) How does the position of balance point (J) change when the resistance R_1 is increased ? (iii) Why cannot the point be obtained, (a) When the emf ε is greater than 2V, and (b) When the key K is closed.



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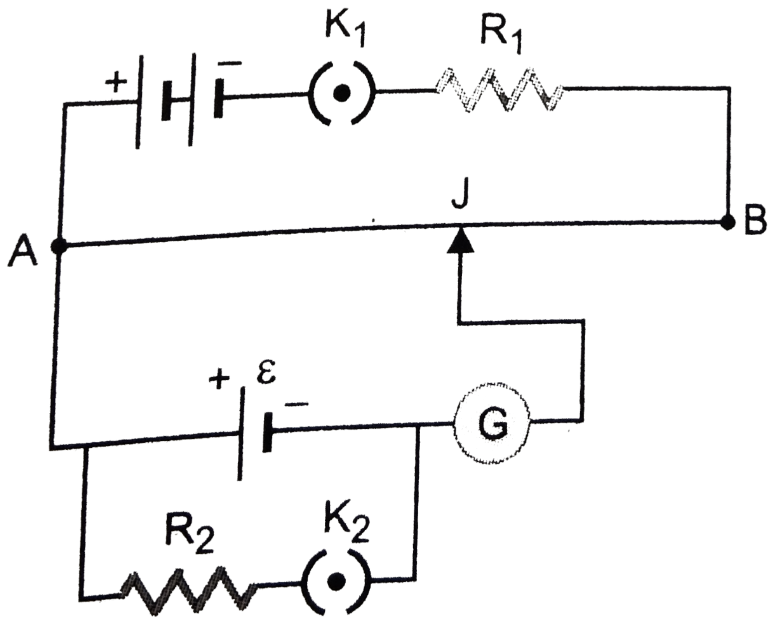
319. For the circuit would the balancing length increase, decrease or remain the same if (i) R_1 is decreased (ii) R_2 is increased, without any change (in each case) in the rest of the circuit ?

Justify your answer in each case.



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320. State the fundamental concepts on which two Kirchhoff's rules are based.

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321. What is the principle of working of meterbridge?

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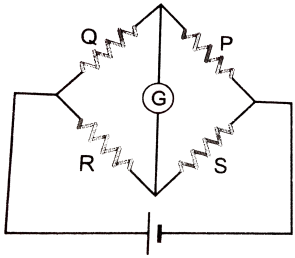
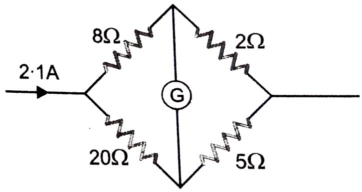
322. In a Wheatstone bridge resistance connected the bridge is balanced , when the resistance are in the ratio





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323. (i) In a meter bridge , the balance point is found to be at $30cm$ from the end A when resistance R in left gap of bridge is of 12Ω. Find resistance S in the right gap of bridge

(ii) If the cell and the galvanometer are interchanged in the balance point, would it effect flow of current through the galvanometer

(iii) Calculate the balance point of the bridge if R and S are interchanged

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324. At what position of the jockey on slide wire bridge, the results are most accurate ?

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325. In a meter bridge, the length of the wire is 100 cm. At what position will the balance point be obtained if the two resistances are in the ratio 1:3?

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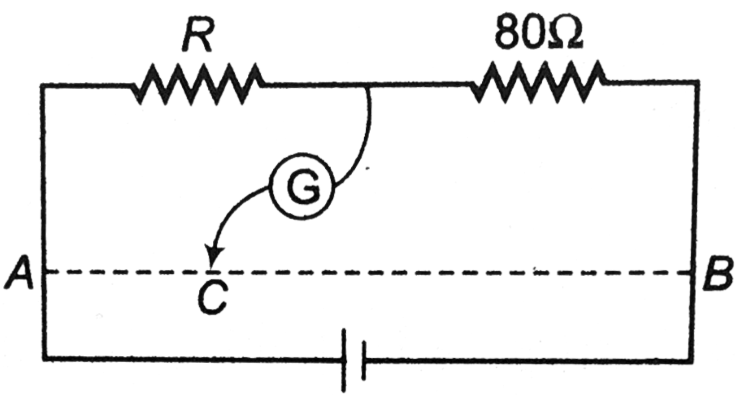
326. AB is a wire of uniform resistance. The galvanometer G shows no deflection when the length $AC = 20cm$ and $CB = 80cm$. The resistance R is equal to.



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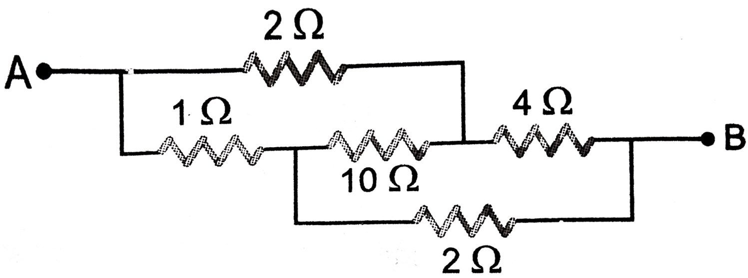
327. Calculate the equivalent resistance between the points A and B of the network shown in figure



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328. Why is the meter bridge suitable for resistance of moderate values only ?

Watch Video Solution

329. State the working principle of potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf's of two primay cells. Obtain the required expression used for comparing the emfs. Write two possible causes for one sided deflection in a potentiometer experiment.

Watch Video Solution

330. Why should the potentiometer wire be of uniform cross-section and composition ?

Watch Video Solution

331. Of which material is a potentiometer wire normally made and why ?

Watch Video Solution

332. Can we use copper wire as potentiometer wire ? Explain.

Watch Video Solution

333. Explain, why should the current be not passed through potentiometer wire for long time ?

Watch Video Solution

334. The emf of the driving cell used in the main circuit of the potentiometer should be more than the potential differnce to be measured. Why?

Watch Video Solution

335. Some times balance point may not be obtained on the potentiometer wire. Why?

Watch Video Solution

336. Whether electric field inside potentiometer wire is constant or variable ?

Watch Video Solution

337. Why do we prefer a potentiometer to measure emf of a cell rather than a voltmeter ?

Watch Video Solution

338. How can you make a potentiometer of given wire length more sensitive using a resistance box?

Watch Video Solution

339. Why do we prefer potentiometer with a longer bridge wire?

Watch Video Solution

340. What should be the properties of the material for the selection of potentiometer wire ?

Watch Video Solution

341. It is advised that the jockey is not to be rubbed on potentiometer wire while using it?

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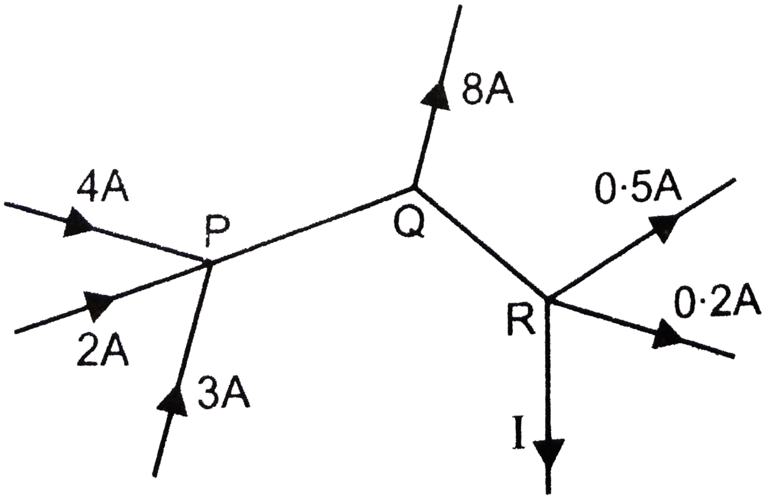
342. A resistance R is connected across a cell of emf ε and internal resistance r. A potentiometer now measures the potential difference between the terminals of the cell is V. Write the expression for r in terms of ε, V and R`.

Watch Video Solution

343. Kirchhoff's first rule obeys law of conservation of charge. Explain.

344. The currents in the parts of an electric circuit. What is the value of I ?



345. Is it necessary to keep the length of the slide-bridge wire 1 meter ? Explian

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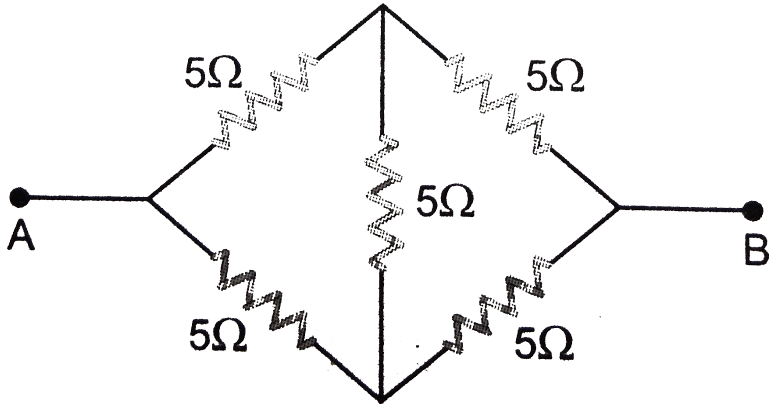
346. Why should the area of cross-section of the meter-bridge wire be uniform ? Explian

Watch Video Solution

347. What is the equivalent resistance between points A and B in the circuit.



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348. Why are the connecting resistors in a meter bridge made of thick copper strips ?

Watch Video Solution

349. Why is the meter bridge method considered unsuitable for the measurement of very low resistances ?

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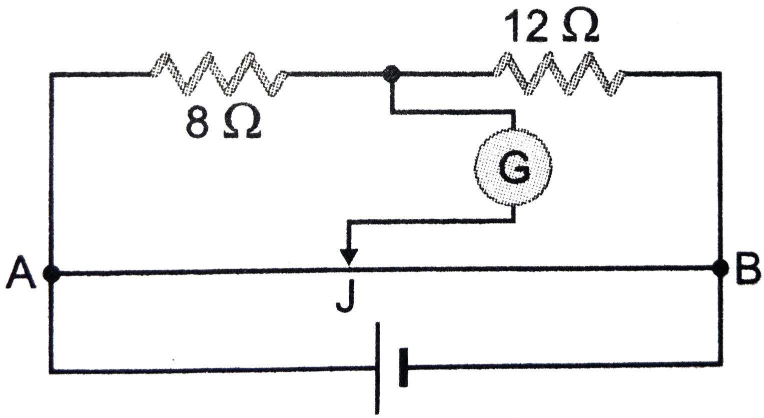
350. What are the advantages of a Wheatstone bridge method of measuring resistance over other methods ?

Watch Video Solution

351. The wire AB of slide wire bridge 68 is 400 cm long. Where should the jockey J whose one end connected to galvanometer,the other end can be connected to AB, so that galvanometer shows no deflection ?



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352. What is potential gradient ? How is it measured ? Explain.

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353. Can you express the potential gradient in terms of specific resistance of the wire ? If yes, find the relation.

Watch Video Solution

354. In a potentiometer experiment, if the area of cross-section of the wire increases uniformly from one end to another, draw a graph showing how potential gradient would vary as the length of the wire increases from one end.

Watch Video Solution

355. What is the unit of potential-gradient ? If the potential gradient along the potentiometer wire be decreased, will the zero-deflection position be obtained at longer length or shorter length ?

Watch Video Solution

356. If the emf of the driving cell be decreased, what will be effect on the position of zero deflection in a potentiometer ? Explain .

Watch Video Solution

357. If the length of the wire be (i) doubled and (ii) halved, what will be effect on the position of zero deflection in a potentiometer ? Explian

Watch Video Solution

358. If the current flowing in the wire of the potentiometer be decreased, what will be effect on the position of zero deflection in potentiometer ? Explain.

Watch Video Solution

359. How can you make a potentiometer of given wire length more sensitive using a resistance box?

Watch Video Solution

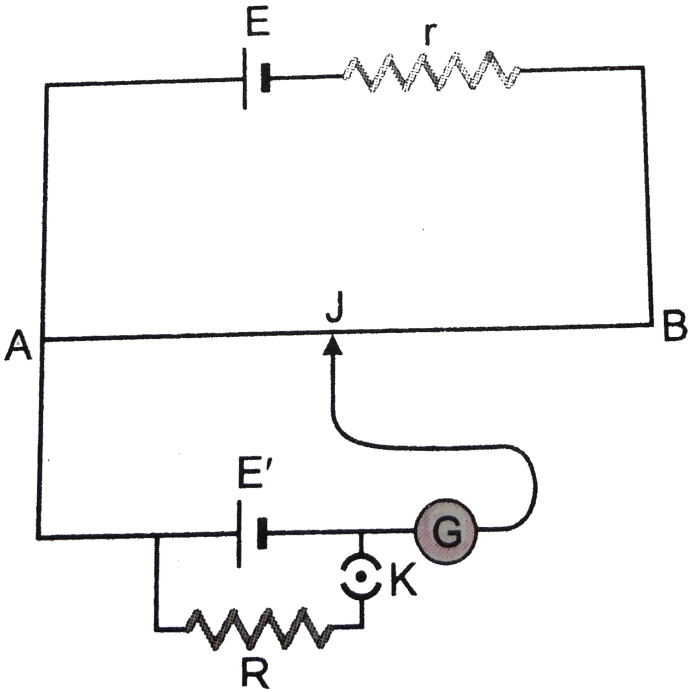
360. Give the circuit diagram of potential divider.

Watch Video Solution

361. Use of potentiometer to measure the internal resistance of a cell.

(i) When the key K is open, how does the balance point change,if the current from the driver cell decreases ? (ii) When the key K is closed, how does the balance point change if R us increased, keeping the current from the driver cell constant

?



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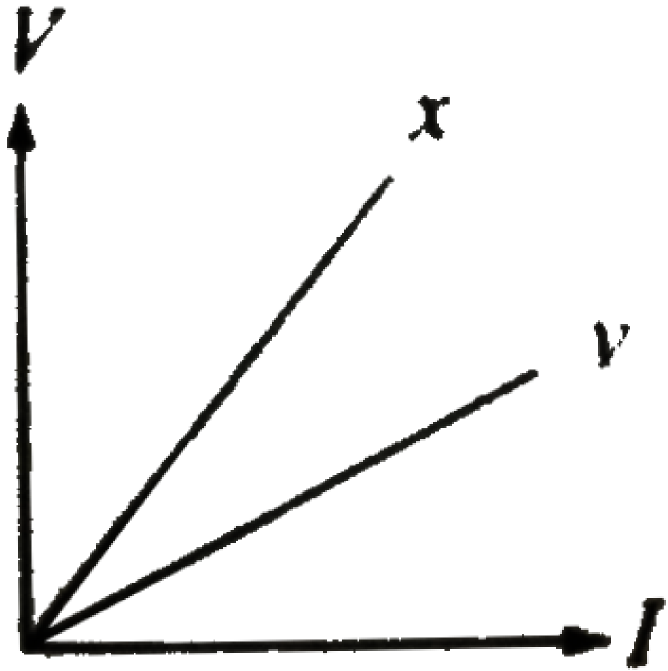
362. The variation of potential difference V with length l in case of two potentiometers X and Y

is as shows in Fig. 6.21. Which of these two will you perfer for comparing the emfs of the two cells and why ?



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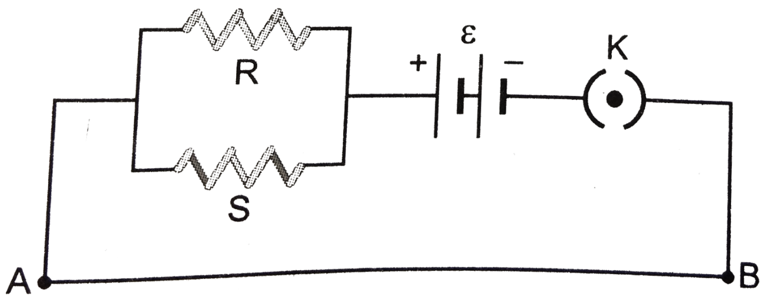
363. A potentiometer wires has a length L and a resistance R_0. It is connected to a battery and a parallel resistance combination of R and S as shown in fogure. Find an exprssion for the potential gradient of the potentiometer wire.



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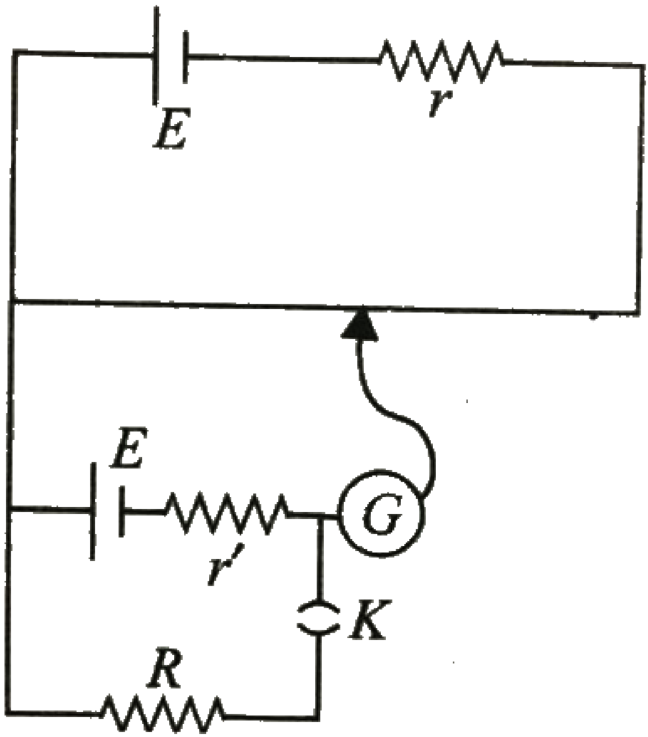
364. The circuit shows in Fig . 6.33 shows the use of potentiometer to measure the internal resistance of a cell.

(a) When the key is open, how does the balance point change, if the driver cell decreases ?

(b) When the key is closed, how does the balance point change, if R is increased, keeping the current from the driver cell constant ?



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365. A potentiometer wire of length 1.0 m has a resistance of 15 ohm. It is connected to a 5 V

source in series with a resistance of 5Ω. Determine the emf of the primary cell which has a balance point at 60 cm.

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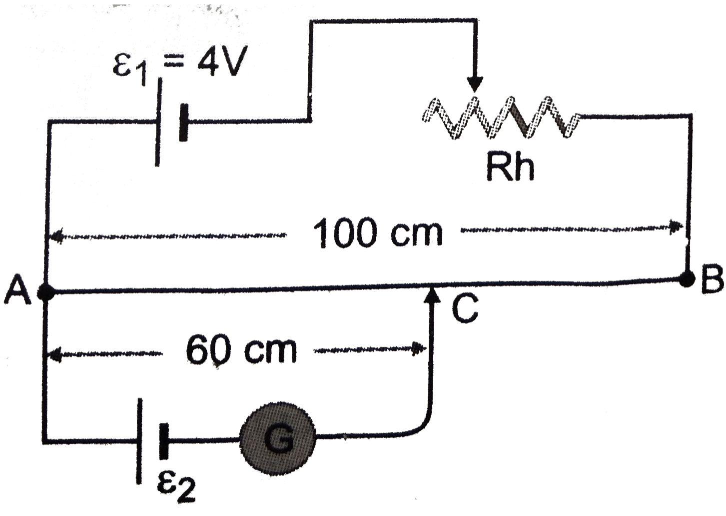
366. A battery ε_1 of 4 V and a variable resistance Rh are connected in series with the wire AB of the potentiometer. The length of the wire of the potentiometer of 1 meter. When a cell ε_2 of emf 1.5 V is connected between points A and C, no currents flows through ε_2 Length AC=60 cm.

(i) Find the potetial difference between the ends

A and B of the potentiometer. (ii) Would the method work, if the battery ε_1 is replaced by a cell of emf of 1 V ?



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367. State the Kirchhoff's rules used in electric networks. How are these rules justified ?

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368. State Wheatstone bridge principle and deduce it using Kirchhoff's rules.

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369. State and prove Wheat stone bridge principle. Discuss the determinaton of unknown temperature with its help.

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370. Draw a circuit diagram of a meter bridge used to determine the unknown resistance R of a given wire. Hence derive the expression for R in terms of the known resistance S.

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371. Potentiometer is superior to voltmeter because

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372. Discuss the principle of potentiometer and explain the determination of potential difference across a conductor using a potentiometer.

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373. State the principle of potentiometer. With the help of circuit diagram, describe a method to find the internal resistance of a primary cell.

Watch Video Solution

374. State the principle of potentiometer. Draw a circuit diagram used to compare the emfs of two primary cells. Write the formula used. How can the sensitivity of a potentiometer be increased.

Watch Video Solution

375. State the Kirchhoff's rules used in electric networks. How are these rules justified ?

Watch Video Solution

376. State the Kirchhoff's rules used in electric networks. How are these rules justified?

Watch Video Solution

377. State the Kirchhoff's rules used in electric networks. How are these rules justified ?

Watch Video Solution

378. State the working principle of potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf's of two primay cells. Obtain the required expression used for comparing the emfs. Write two possible causes for one sided deflection in a potentiometer experiment.

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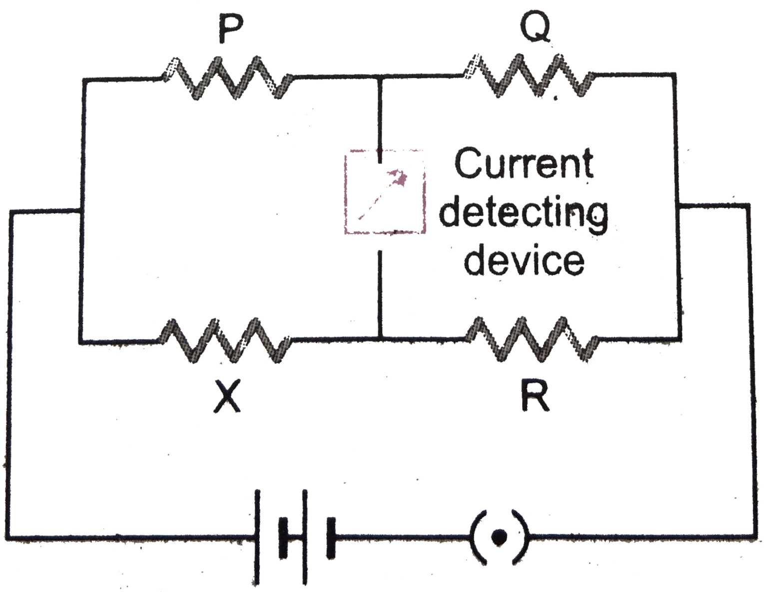
379. State the principle of potentiometer. With the help of circuit diagram, describe a method to find the internal resistance of a primary cell.

Watch Video Solution

380. (a) Obtain the condition under which the current flowing in the current detecing device used in the circuit shown in figure, becomes zero.

(b) Describe briefly the device, based on the above condition. Draw a circuit diagram for this device and discuss, in brief, how it is used for finding as unknown resistance.



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381. How many electrons flow through the filament of 220 V and 100 W electric lamp per second. Given, electronic charge $= 1.6 \times 10^{-19} C$.

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382. A heating element is marked 210 V, 630 W. What is the current drawn by the element when

connected to a 210 V dc mains ? What is the resistance of an element ?

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383. An electric motor operates on a 110 V supply and draws a current of 10 A. If the motor yields a mechanical power of 330 watt, what is the efficiency of the motor ?

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384. A $1kW$ heater is meant to operate at $200V$.

(a) What is the resistance?

(b) How much power will it consume if the line voltage drops to $100V$?

(c) How many units of electrical energy will it consume in a month $(of30days)$ if it operates $10h$daily at the specified voltage $(200V)$?

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385. Out of the two, a toaster of $1kW$ and an electric heater of $2kW$, which has a greater resistance ?

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386. A $500W$ heating unit is designed to operate from a $200V$ line . By what percentage will its heat output drop if the line voltage drops to $160V$? Find the heat produced by it in 10 min .

Watch Video Solution

387. We have a $30W, 6V$ bulb , which we want to glow by a supply of $120V$. What can be done for this ?

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388. An electric power station (100 MW) transmits power to a distant load through long and thin cables. Which of the two modes of transmission would result in lessere power wastage : Power transmission of : (i) 20,000 V or (ii) 200 V?

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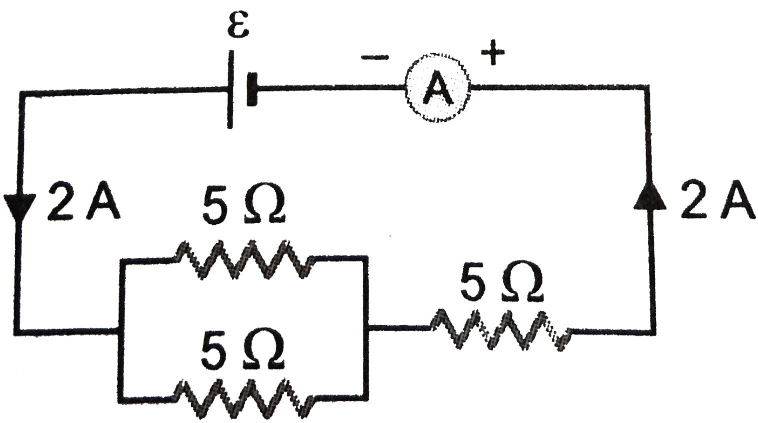
389. The three resistances, each of value 5Ω are connected to the source of emf ε through ammeter A as shown in figure. If ammeter shows a reading of 2 A, calculate the power dissipated in the circuit.



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390. A dry cell of emf $1.6V$ and internal resistance of 0.10Ω is connected to a resistor of resistance $R\omega$. If the current drawn the cell is $2A$, then (i) What is the voltage drop across R ? (ii) What is the rate of energy dissipation in the resistor ?

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391. The potential difference applied across a given resistor is altered so that the heat produced per second increases by a factor of 9.

By what factor does the applied potential difference change ?

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392. A 10 V storage battery of negilgible internal resistance is connected across a 200V battery and a resistance of 50Ω resistor made of alloy manganin. How much heat energy is produced in the resistor in 1 h? What is the source of this energy?

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393. A heating coil is rated $100W$, $200V$. The coil is cut in half and two pieces are joined in parallel to the same source . Now what is the energy $(\text{in} \times 10^2 J)$ liberated per second?

Watch Video Solution

394. A resistance coil is made by joining in parllel two resistances each of 10Ω. An emf of 1.0V is applied between the two ends of the coil for 5 minutes. Calculate the heat produced in calories. (Given 1 cal. = 4.2 J)

Watch Video Solution

395. Two heaters are marked 200V, 300W and 200 V, 600 W. If the heaters are combined in series and the combination connected to a 200 V dc supply, which heater will produce more heat ?

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396. A heating coil of $2000W$ is immersed in water . How much time will it take in raising the temperature of $1L$ of water from $4^\circ C \text{to} 100^\circ C$?

Only 80% of the thermal energy produced is used in raising the temperature of water.

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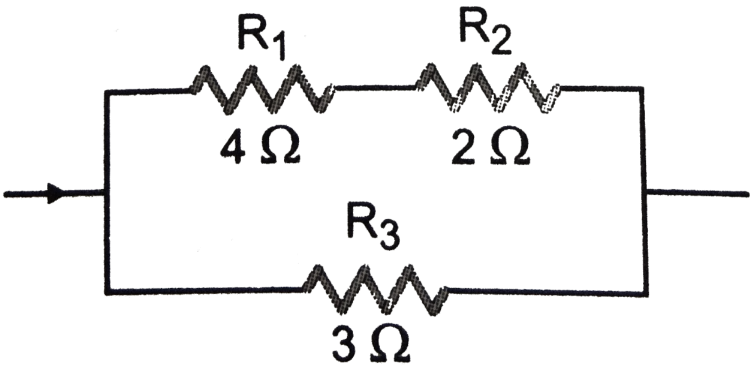
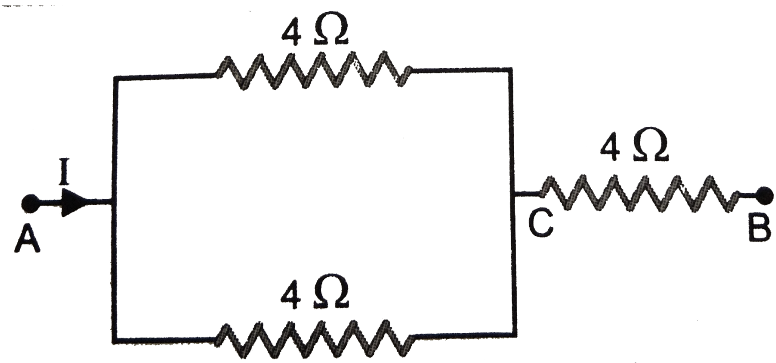
397. In a part of circuit shown in the figure, the rate of heat dissipation in $4Oemga$ resistor is $100Js^{-1}$. Calculate the heat dissipated in the 3Ω resistor in 10 second.



398. The resistance of each of the three wires joined as shown in figure is 4Ω and each one can have a maximum power of 20 watt (otherwise it will melt). What maximum power will the whole circuit dissipate ?



399. A house is fitted with 20 length of 60 watt each 10 fans consuming 0.5 ampere each an electric kettle of resistance 110Ω. If the energy is supplied at $120V$ and costs 150 paise kWh, calculate monthly bill for running these appliances for 6 hours a day (1 length = 30 days).

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400. Two uniform wires of same material , each weighing $1g$ but one having double the length of the other, are connected in series , carrying a current of $10A$. The length of the longer wire is $20cm$. Calculate the rate of consumption of energy in each of the two wires. which wire gets hotter ? The resistivity of the material of the wire is $20 \times 10^{-5} \Omega cm$. (Density of material =11 units)

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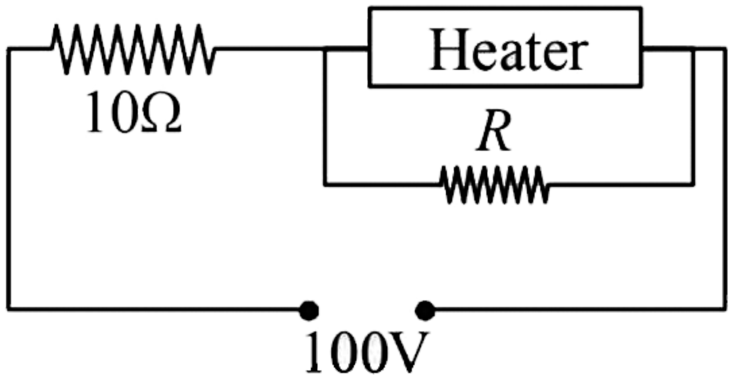
401. A heater is designed to operate with a power of 1000 walts in a 100 volt line. It is connected in a combinations with a resistance of 10 ohms and a resistance R to a 100 volts mains as shown in figure. What should be the value of R so that the heater operates with a power of 62.5 watts.



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402. Find the resistance of $240V - 200$ watt electric bulb when glowing. If this resistance is 10 times the resistance at $0^{\circ}C$ and the temperature of the glowing filament is $2000^{\circ}C$, then find the temperature coefficient of resistance of the filament.

Watch Video Solution

403. A copper electrical kettle weighing 1 kg contians 0.5 kg of water at $20 \circ C$. It takes 10 minutes to raise the temperature to $100^{\circ} C$. If the electric energy is supplied at 220V, calculate the strength of the current,assuming that 20% heat is washed. Specific heat of copper is 0.1.

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404. Find the resistance of $240V - 200$ watt electric bulb when glowing. If this resistance is 10 times the resistance at $0^\circ C$ and the temperature of the glowing filament is $2000^\circ C$, then find the temperature coefficient of resistance of the filament.

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405. A thin metallic wire of resistance 100Ω is immersed in a calorimeter containing 250 g of water at $10^\circ C$ and a current of 0.5 ampere is passed through it for half an hour. If the water equivalent of the calorimeter is 10 kg, find the final temperature of water.

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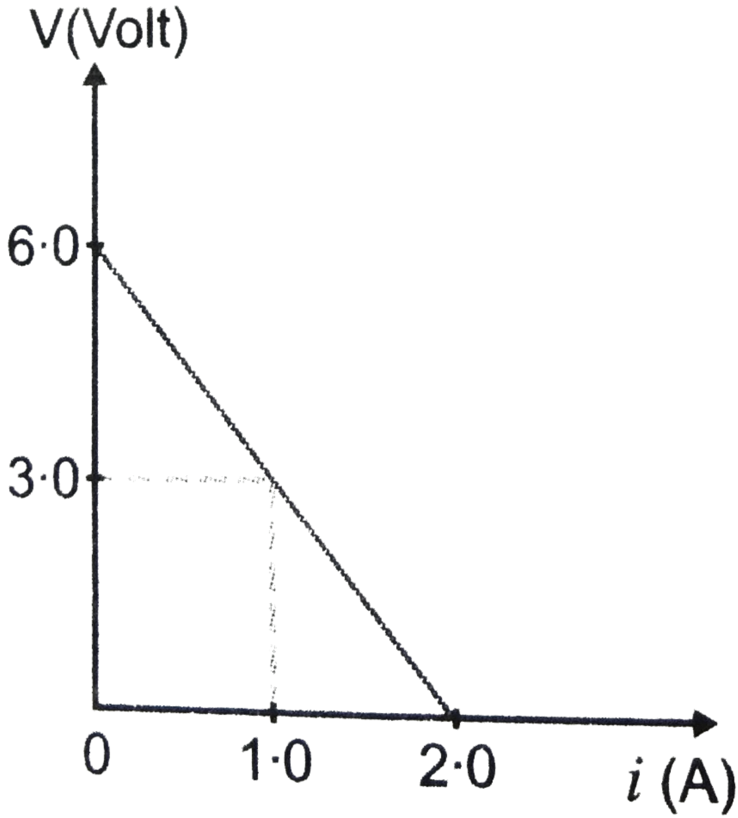
406. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor versus the current I :

(i) Calculate the emf of each cell. (ii) For what current I, will the power dissipation of the circuit

be maximum ?



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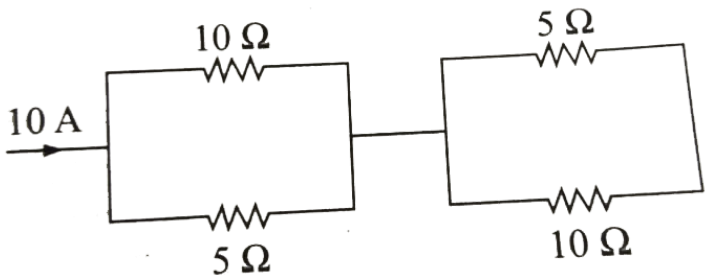
407. Four resistances carrying a current shown in Fig. 7.41 are immersed in a box containing ice at $0^{\circ} C$. How much ice must be put in the box every 10 min to keep the average quantity of ice in the box constant? Latent heat of ice is $80 cal g^{-1}$.



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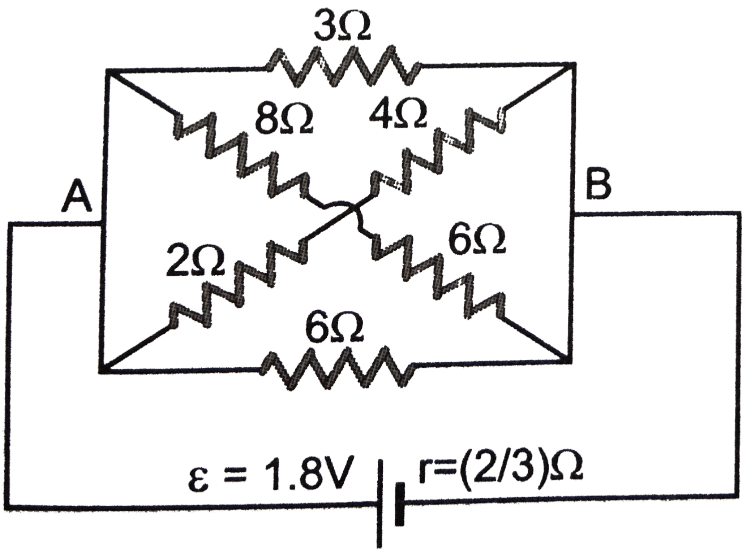
408. The emf of the cell is 1.8 V and internal resistance is $2/3\Omega$, calculate the current in the $3Oemga$ resistance and the power dissipated in the whole circuit.



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409. A wire connected to a bulb does not glow, whereas the filament of the bulb gilows when same current flows through them. Why?

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410. By what percentage will the illimination of the lamp decrease if the current drops by 20% ?

Watch Video Solution

411. A coil of enamelled copper wire of resistance 50Ω is embedded in a block of ice and a potential difference of 210 V applied across it. Calculate, how much ice will melt in half minute. Latent heat of ice is 180 cal per gram.

Watch Video Solution

412. An electric motor runs on a d.c. source of emf ε and internal resistance r. show that the power output of the source is maximum when the current drawn by the motor is $\varepsilon / 2r$.

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413. In the above question, show that power output of electri motor is maximum when the back emf is one-half of the sourece emf, provided the resistance of the winding of the motor is negligible .

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414. The maximum power rating of a 20Ω resistor is 2.0 kW. [That is, this is the maximum power the resistor can dissipate (as heat) without melting or changing in some other undersirable way]. Would you connect this resistor directly across a 300 V d.c. source of negligible internal resistance ? Explain your answer.

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415. A nichrome heating element across 230 V supply cosumes 1.5 kW power and heats upto a temperature of $750^{\circ} C$. A tungsten bulb across the same supply operates at a much higher temperature of $1600^{\circ} C$ in order to be able to emit light. Does it mean that tungsten bulb necessarily cosumes greater power ?

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416. When current is passed through a heater, the heat is generated continously in it but its temperature becomes constant after sometime . Why ?

Watch Video Solution

417. Nichrome and copper wires of same length and area of cross-section are connected in sereis, current is passed through them. Why does the nichrome wire get heated first ?

Watch Video Solution

418. A heater joined in series with a $50W$ bulb is connected to the mains . If the $50W$ bulb is replaced by a $100W$ bulb , then will the heater now give more heat , less heat, or same heat ? Why ?

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419. Two 120 V light bulbs, one of 25 W other of 200 W were connected in series across a 240 V line. One bulb burnt out almost instantaneously. Which one was burnt and why ?

Watch Video Solution

420. Prove that in parallel combination of electrical appliances, total power consumption is equal to the sum of the powers of the individual appliances.

Watch Video Solution

421. There is a frill of 20 bulbe (connected in series) in a room. One bulb is fused. The remaining 19 bulbs are again joined in series and connected to the same supply. Will the light increase or decrease in the room ?

Watch Video Solution

422. What is the power transferred per unit volume into joule heat in a resistor ?

Watch Video Solution

423. Prove that in series combination of electrical appliances, the reciprocal of total power consumption is equal to the sum of the reciprocal of the powers of the individual appliances.

Watch Video Solution

424. A battery has an emf E and internal resistance r. A variable resistance R is connected across the terminals of the battery. Find the value of R such that (a) the current in the circuit id maximum (b) the potential difference across the terminals is maximum.

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425. For what value of load resistance, the power transfer is maximum when two identical cells each of emf E and internal resistance r are connected (a) in series (b) in parallel.

Watch Video Solution

426. Long distance power transmission is carried on high voltage line. Why ?

Watch Video Solution

427. Two tungsten lamps with resistances R_1 and R_2, respectively , are connected first in parallel and then in series in a lighting circuit of negligible internal resistance. Given $R_1 > R_2$.

(a) Which lamp will glow more brightly when they are connected in parallel ?

(b) If the lamps of resistance R_1 now burns out, how will the net illumination produced change ?

(c) Which lamp will glow more brightly when they are connected in series ?

(d) If the lamp of resistance R_2 now burns out and lamp R_1 alone is plugged in , will the net illumination increase or decrease ?

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428. How does use of a fuse-wire protect electrical appliances ?

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429. Bulbs fuse sometimes when they are switched on. Why ?

Watch Video Solution

430. Why the brightness of light emitted by a bulb decreases gradually with its period of use?

Watch Video Solution

431. If one wants more light at large distances, assuming the wattage is the same, will one use a point source or a cylindrical tubelight ?

Watch Video Solution

432. An electric power station (10 MW) transmits power to a distant load through long and thin cables. Which of the two modes of transmission would result in lessere power wastage : Power transmission of : (i) 20,000 V or (ii) 200 V?

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433. A line having a total resistance of $0.2\ \omega$ delivers $10KW$ at $220V$ to a small factory . Calculate the efficiency of transmission .

Watch Video Solution

434. What is the law defines heat produced by an electric current ?

Watch Video Solution

435. 100 W, 220 V bulb is coonected to 110 V source. Calculate the energy consumed (in unit of electricity) by the bulb in 1 hour.

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436. A heater coil is cut into two parts of equal length and one of them is used in the leader. The ratio of the heat procued by this half coil to that by the original coil is

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437. Name the physical quantity which has its unit joule coulomb^{-1}. Is it a scalar or vector quantity?

Watch Video Solution

438. An ammeter reads a current of 30 A when it is connected across the terminals of a cell of emf 2 V. Neglecting the meter resistance, find the amount of heat (in calories) in cell in 20 seconds.

Watch Video Solution

439. What do you understand by maximum power rating of a resistor ?

Watch Video Solution

440. Which has greater resistance : 1 kW electroheater or a 110 W filament bulb, both marked for 220V?

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441. Two resistors of 2Ω and 4Ω are connected in parallel to a constant d.c. voltage. In which case more heat is produced ?

Watch Video Solution

442. Distinguish between kilowatt and kilowatt hour.

Watch Video Solution

443. A heating element is marked 210 V, 630 W. What is the value of the current drawn by the element when connected to a 210 V dc source ?

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444. Write an expression for the heat produced when an electric current is passed through it.

Watch Video Solution

445. What is the meaning of 1 unit electric energy in domestic use?

Watch Video Solution

446. How amny joules of energy is equivalent to 1 k Wh?

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447. What is the no. of kWh in 1 joule ?

Watch Video Solution

448. If the current in the electric bulb changes by 1%, then by what percentage will the power change?

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449. A current in a circuit having constant resistance is tripled. How does this affect the power dissipation?

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450. Two identical heaters rated $220V$, $1000W$ are paced in series with each other across $220V$ line , then the combined power is

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451. Nichrome and copper wires of same length and same radius are connected in series. Current is I passed through them. Which up more ? Justify your answer.

Watch Video Solution

452. What is the difference between heater wire and fuse wire ?

Watch Video Solution

453. What is the safest voltage you can put across a $98\Omega - 0.5W$ resistor ?

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454. There bulbs 40 W, 60 W and 100 W are connected in series to 220 V 4 mains. Which bulb will glow brightly ?

Watch Video Solution

455. Why does the cord of an electric heater not glow while the heating element does ?

Watch Video Solution

456. Of what substance is a fuse wire made of?

Watch Video Solution

457. State the characteristics of fuse wire.

Watch Video Solution

458. What do you mean by specification of a bulb or other electric appliances ?

Watch Video Solution

459. The temperature of the filament of an electric bulb is $2700^{\circ} C$ when it glows. It is not burnt up at such a high temperature. Why?

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460. Why an electric bulb becomes dim when an electric heater in parallel circuit is switched on? Why dimness decreases after some time?

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461. The two electric bulbs of same power are connected in parallel circuit. If one bulb is glowing and then another bulb is switched on, then brightness of the first bulb increases, decreases or remians unchanged. Expalin.

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462. Three identical resistors, each of resistance R, when connected in series with a d.c. source, dissipate power X. If the resistors are connected in parallel to the same d.c. source, how much power will be dissipated ?

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463. The rate of Joule heat is given by $P = V \times I$ where V is the potential difference across the ends of a conductor and I is the current flowing through it. Does this relation hold for a condutor that does not obey Ohm's law?

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464. Two bulbs of same wattage, one having a carbon filament and the other having a metallic filament, are connected in series to the mains. Which one will glow more ?

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465. Current is allowed to flow in a metallic wire at a constant potential difference. When the wire becomes hot, cold water is poured on half portion of the wire. By doing so, its other portion becomes still more hot. Explain its reason.

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466. Two wires A and B of the same material and having same length, have their cross-sectional areas in the ratio $1:4$. what should be the ratio of heat produced in these wires when same voltage is applied across each ?

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467. Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :

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468. An electric kettle has two coils. When one of these is switched on, the water in the kettle boils in 6 minutes. When the other coil is switched on, the water boils in 3 minutes. If the two coils are connected in series, find the time taken to boil the water in the kettle.

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469. An electric kettle has two heating coils. when one coil is used, water in the kettle boils in 5 minutes, while when second coil is used, same water boils in 10 minutes. If the two coils, connected in parallel are used simultaneously.the same water will boil in time

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470. Under what is the heat produced in an electric circuit: (i) directly proportional (ii) inversely proportional to the resistance of the circuit ?

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471. Two wires A and B of the same material and having same length, have their cross-sectional areas in the ratio $1:6$. what should be the ratio of heat produced in these wires when same voltage is applied across each ?

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472. A boy has two wires of iron and copper of equal length and diameter. He first joins the two wires in series and passes electric current through this combination which increases gradually with tiem. After that he joins them in parallel and repeat the process of passing the current in this arrangement also. Which wire will glow first in each case and why ?

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473. In an electric kettle, water boils in 10 minutes after the kettle is switched on. With the same supply voltage if the water is to be boiled in 8 minutes, should the length of the heating elemnet be increased or decreased ? Explain .

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474. Two bulbs of resistance 40Ω and 400Ω are in series in a circuit fed with supply current. Which one will glow more ? If one of these bulbs be switched off, will the light in the room increases or decrease ?

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475. A heater joined in series with a $50W$ bulb is connected to the mains . If the $50W$ bulb is replaced by a $100W$ bulb , then will the heater now give more heat , less heat, or same heat ? Why ?

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476. Of the bulbs in a house, one glows brighter than the other, which of the two has a large resistance.

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477. Assertion : Two electric bulbs of 50 and $100W$ are given. When connected in series $50W$

bulb glows more but When connected parallel $100W$ bulb glows more .

Reason : In series combination, power is direclty proportional to the resistance of circuit. But in parallel combination, power is inversely proportional to the resistance of the circuit.

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478. What is the difference between heater wire and fuse wire ?

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479. An immersion heater is rated 836 watt. In what time, it should heat 1 litre of water from $20^{\circ} C$ to $40^{\circ} C$? $J = 4.18 J / cal.$

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480. A house hold circuit has a fuse of 5 A rating. Calculate the maximum number of bulbs of rating 60 W - 220 V each which can be connected in this house hold circuit.

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481. State Joule's law of heating effect of electric current. What is the cause of it ? Is it reversible or not ?

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482. What is electric power? Derive an expression for the same. Give its SI unit.

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483. Explain electric energy. Give the various relations of electric energy and define the commercial unit of electric energy .

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484. What do understand by heating effect of current? Explain its cause and find the relation for the heat produced in a conductor for electric current.

Watch Video Solution

485. Expalin electric power,electric energy and define their units and give their relations.

Watch Video Solution

486. Discuss atleast 3 important aspects of heating effect of current.

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487. A N-type silicon sample of width $4 \times 10^{-3} m$, thickness and length $6 \times 10^{-2} m$ carriers a

current of $4.8mA$, when the voltage is applied across the length of the sample. The free electron density is $10^{22}m^{-3}$

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488. The area of cross-section, length and density of a piece of a metal of atomic weight 60 are $10^{-6}m^2$, $1.0m$ and $5 \times 10^3 kg/m^3$ respectively,every atom contributes one free electron. (Given Avogadro number $= 6 \times 10^{23}/mol)$. Find the drift velocity of electrons in the metal when the current of $16A$ passes through:

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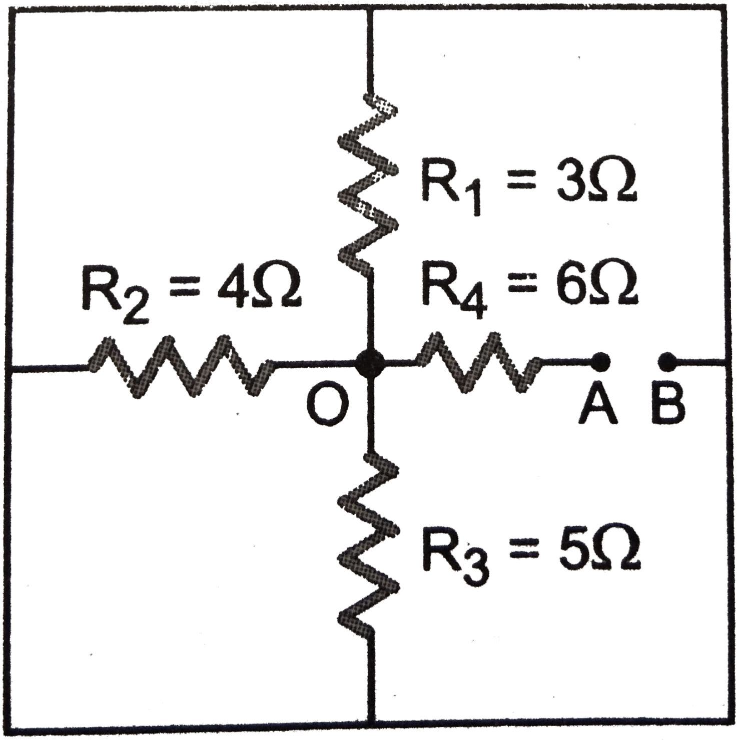
489. What is the equivalent resistance between points A and B of the networks of resistors.



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490. A long cylindrical conductor of cross-sectional area A and radius a is made of material whose resistivity depends only on a distance r from the axis of conductor, given by $\rho = \frac{c}{r^2}$, where c is a constant. Find the resistance per unit length of the conductor and the electric field strength due to which a current I flows in it.

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491. A cylindrical wire if radius R = 2 mm is of uniform area of cross-section. The current density through a cross-section varies with radial distance r as $J = ar^2$, where $a = 3.2 \times 10^{11} A/m^2$ and r is in metres. What is the current through the outer portion of the wire between radial distances $R/2$ and R?

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492. Two wires of different materials P and Q have resistance per unit lengths $50\Omega km^{-1}$ and $25\Omega km^{-1}$ and temperature coefficients of resistance, $0.0025^{\circ}C^{-1}$ and $0.00075^{\circ}C^{-1}$ respectively. If it is desired to make a coil having 700Ω resistance and a temperature coefficient of resistance $0.001^{\circ}C^{-1}$ by using suitable length of two wires in series. Calculate their respective length.

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493. A charged belt 60 cm wide, travels at $20ms^{-1}$ between a source of charge and a sphere. The belt carries charges into the sphere at a rate corresponding to $120\mu A$. Calculate the surface charge density of the belt.

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494. A steady beam of α-particles travelling with kinetic energy $E = 83.5keV$ carries a current of $I = 0.2\mu A.$ Mass of α-particle $= 6.68 \times 10^{-27} kg.$

(i) If this beam strikes a plane surface at an angle $\theta = 60^\circ$ with normal to the surface, how many α-particles strike the surface in t=4 second?

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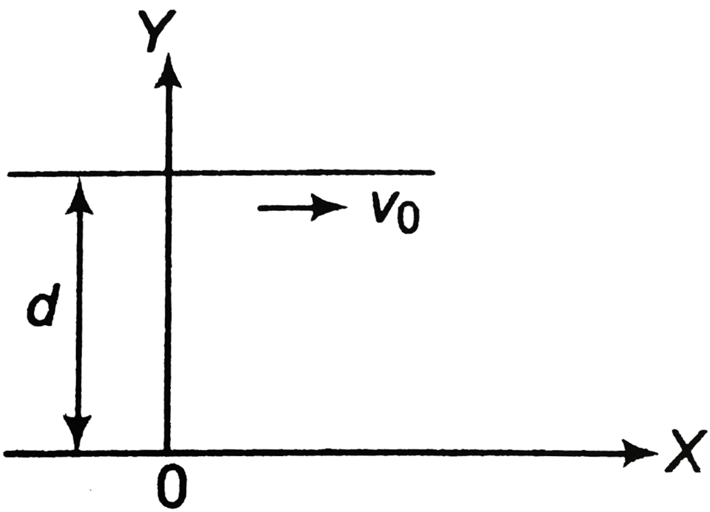
495. Velocity of the river with respect to ground is given by v_0. Width of the river is d. A swimmer swims (with respect to water) perpendicular to the current with acceleration $a = 2t$ (where t is time) starting from rest from the origin O at $t = 0$. The equation of trajectory of the path followed by the swimmer is



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496. When 5 V potential difference is applied across a wire of length 0.1 m. The drift speed of electrons is $2.5 \times 10^{-4} ms^{-1}$. If the electron density in the wire is $8 \times 10^{28} m^{-3}$, calculate the resistivity of the material of wire

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497. Obtain a general relationship between temperature coefficient of resistance α_1 and α_2 at temperature $T_1 . ^\circ C$ and $T_2 . ^\circ C$ for a given conductor.

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498. What amount of heat will be generated in a coil of resistance R due to a charge q passing through it if the current in the coil

a. decreases down to zero uniformly during a time interval t_0?

b. decrases down to zero having its value every t_0 seconds?

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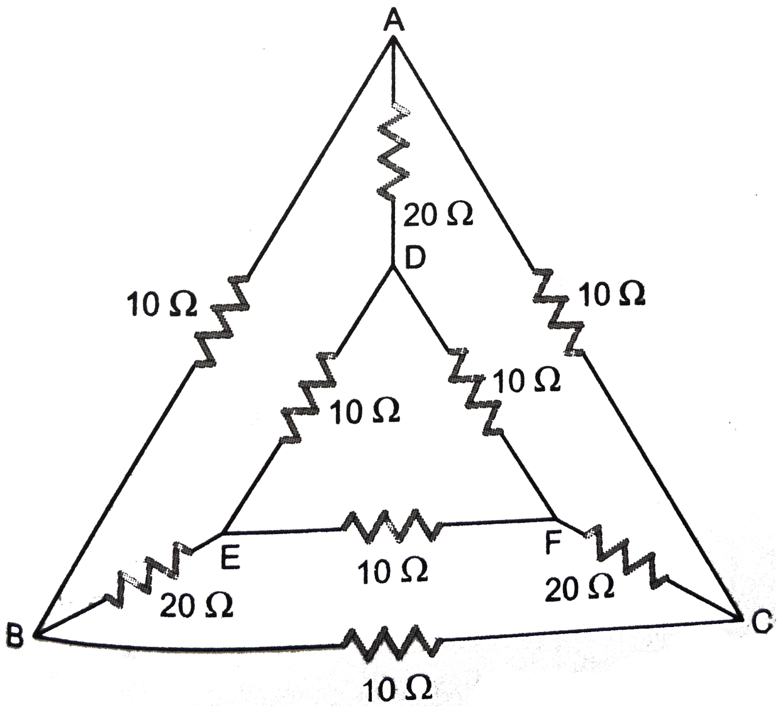
499. The network of resistors. Find the equivalent resistance between points A and D.



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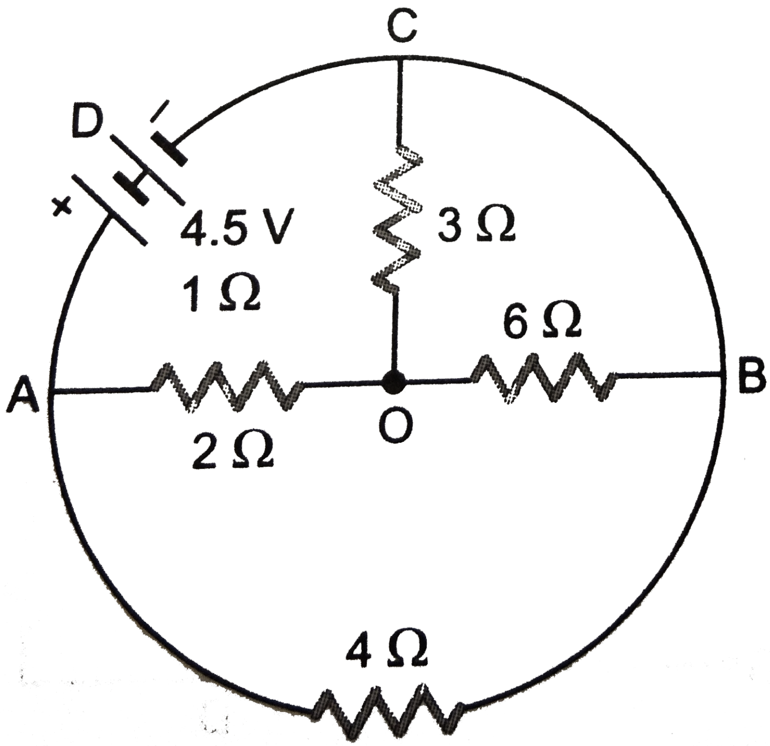
500. Find the power dissipated in 3Ω resistance of the network of resistors.



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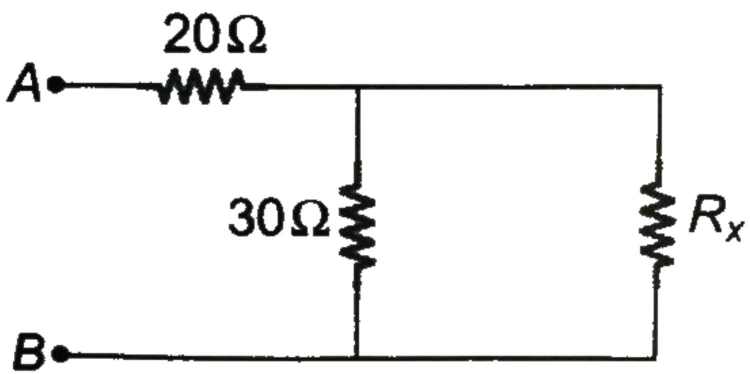
501. A circuit shown in the figure has resistances 20Ω and 30Ω. At what value of resistance R_x will the thermal power generated in it be practically independent of small variations of that resistance? The voltage between points A and B is supposed to be constant in this case.



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502. A series-parallel combination battery consists of 300 identical cells, each with an internal resistance 0.3Ω. It is connected to the external resistance 10Ω. Find the number of parallel goups cosisting of equal number of cells connected in series, at which the external resistance generated the higher thermal power.

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503. It is required to send a current of 10 A through a resistance $R = 3\Omega$. (a) What is the minimum number of cells required if each cell has an emf of 10 V and internal resistance 1Ω. (b)

Find the power dissipated in R.

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504. The walls of a closed cubical box of edge $40cm$ are made of a material of thickness $1mm$ and thermal conductivity $4 \times 10^{-4} cal s^{-1} {}^{\circ}C^{-1}$. The interior of the box is maintained at $100^{\circ}C$ above the outside temperature by a heater placed inside the box and connected across $400V dc$. Calculate the resistance of the heater.

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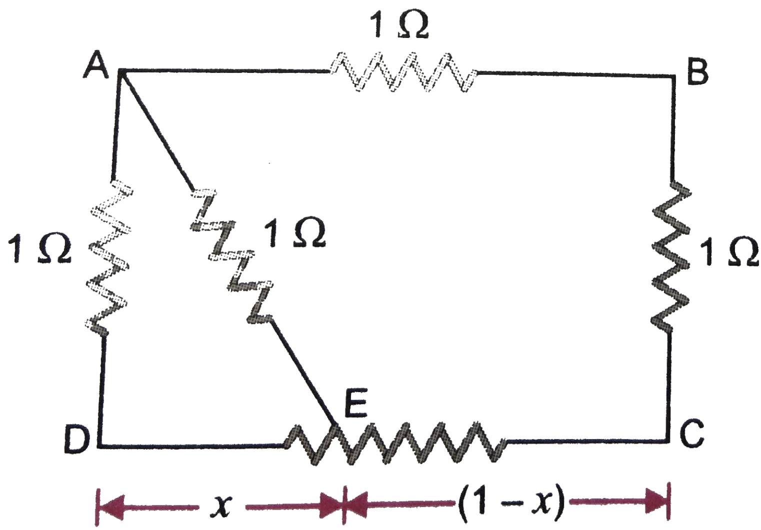
505.



ABCD is a square where each side is a uniform wire of resistance 1Ω. Find a point E on CD such that if a uniform wire of resistance 1Ω is connected across AE and a constant potential is applied across A and C, the points B and E will be equipotential.

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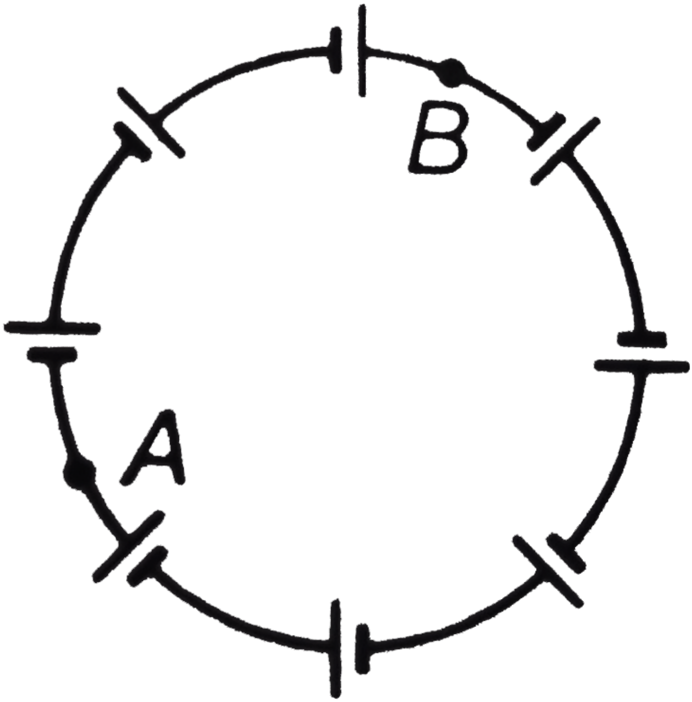
506. N identical current sources each of emf E and internal resistance r are connected to form a closed loop as shown in figure. The potential difference between points A and B which divides the circuit into n and (N-n) units is



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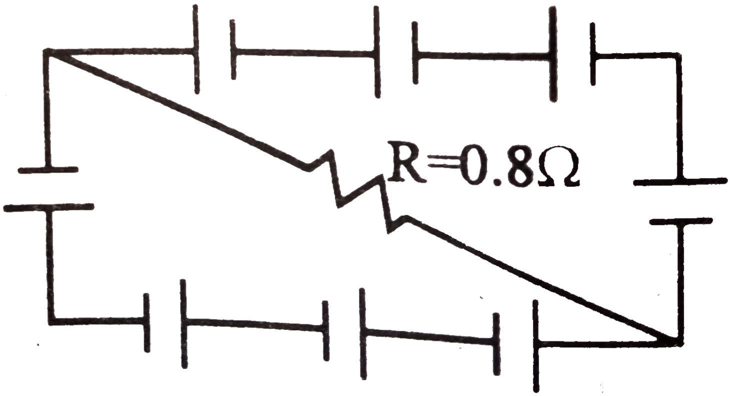
507. A circuit is comprised of eight identical batteries and a resistor $R = 0.8\Omega$. Each battery has an emf of $1.0V$ and internal resistance of 0.2Ω. The voltage difference across any of the battery is



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

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509. A battery of emf 10 v and internal resistane 3Ω is connected to a resistor. If the current in the circuit is 0.5 A, what is the resistane of the resistors ? What is the terminal voltage of the battery when the circuit is closed ?

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

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

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

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

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512. At room temperature $(27.0^{\circ} C)$ the resistance of a heating element is 100Ω. What is the temperature of the element if the resistane is found to be 117Ω, given that the temperature co-efficient of the material of the resistor is $1.70 \times 10^{-4} .^{\circ} C^{-1}$.

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513. A negligibly small current is passed through a wire of length 15 m and uniform cross-section $6.0 \times 10^{-7} \Omega m^2$, and its resistance is measured to be 5.0Ω. What is the resistivity of the material at the temperature of the experiment ?

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514. 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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515. A heating element using nichrome connected to a 230 V supply draws a initial current of 3.2 A which settles after a few seconds to a steady value of 2.8 A. What is the steady temperature of the heating elemtn if the room temperature is $27.0^\circ C$? Temperature coefficient of resistance of nichrome of nichrome averaged over the temperature range involved is $70 \times 10^{-4} C^{-1}$

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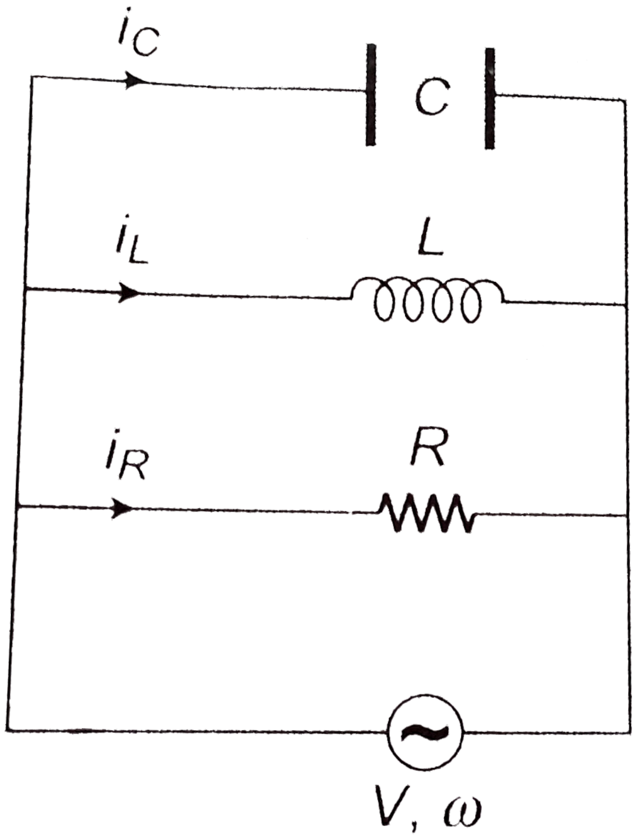
516. Determine the impedance of the circuit phase of current



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517. (i) In a meter bridge , the balance point is found to be at $30cm$ from the end A when resistance R in left gap of bridge is of 12Ω. Find resistance S in the right gap of bridge

(ii) If the cell and the galvanometer are interchanged in the balance point, would it effect flow of current through the galvanometer

(iii) Calculate the balance point of the bridge if R and S are interchanged

518. (i) A storage battery of emf $8V$, internal resistance 1Ω is being charged by a $120V$ d.c. source using a 15Ω resistor in series in the circuit. Calculate the current in the circuit (ii) terminal voltage across the battery during charging and (ii) chemical energy stored in the battery in 5 minutes.

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519. 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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520. The number density of free electrons in a copper conductor is estimated at $8.5 \times 10^{28} m^{-3}$. 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 3.0A.

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

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522. (a) Six lead-acid type of secondary cells each of emf $2 - 0$ V and internal resistance $0 - 015\Omega$ are jouned in series to provide a supply to a resistance of $8 - 5\Omega$. 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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523. Two wires of equal length, one of aluminium and the other of copper have the same resistance. Which of the two wires is lighter ? Hence explain why aluminium wires are perferred for overhead power cables. Given For $AI.\ p_1 = 2.63 \times 10^{-8} \Omega m,$ For $Cu, p_2 = 1.72 \times 10^{-8} \Omega m.$ Relative density of $AI = 2.7$ of $Cu = 8.9.$

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524. Answer the following questions : (a) A steady current flows in a metallic conductor of non-uniform cross-section. Explain which of these quantities is constant along the conductor : current, current density, electric field and drift speed ?

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

(c) A low voltage supply from which one needs high currents must have low internal resistance, why ?

(d) A high tension (HT) supply of say $6kV$ must have a very large internal resistance. why ?

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525. Choose the correct alternatives :

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

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

(c) The resistivity of the alloy manganin in (nearly independent of/ increase rapidly) with increase of temperature.

(d) The resistivity of a typical insulator (e.g. amber) is greater than that of a metal by a factor of the order of $(10^{22} \text{ or } 10^{3})$.

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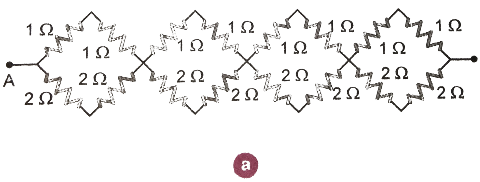
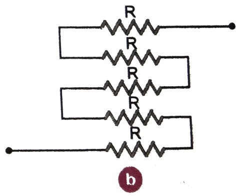
526. (a) Given n resistors each of resistance R. How will you combine them to get the (i) maximum (ii) minimum effective resistance ? What is the ratio of the maximum to minimum resistance ?

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

(c) Determine the equivalent resistance of networks shown in Figure.





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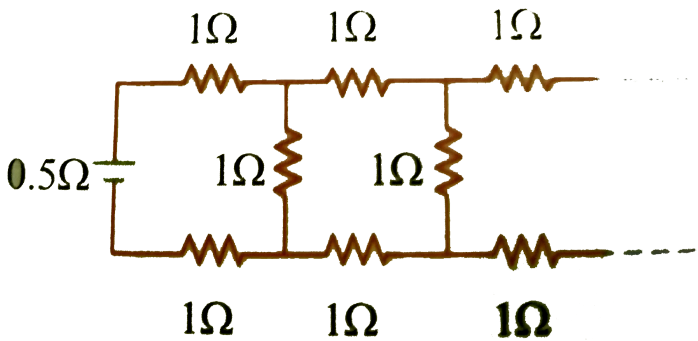
527.



Determine the current drawn from a $12V$ supply with internal resistance 0.5Ω. By the infinite network shown in fig. Each resistor has 1Ω resistance.

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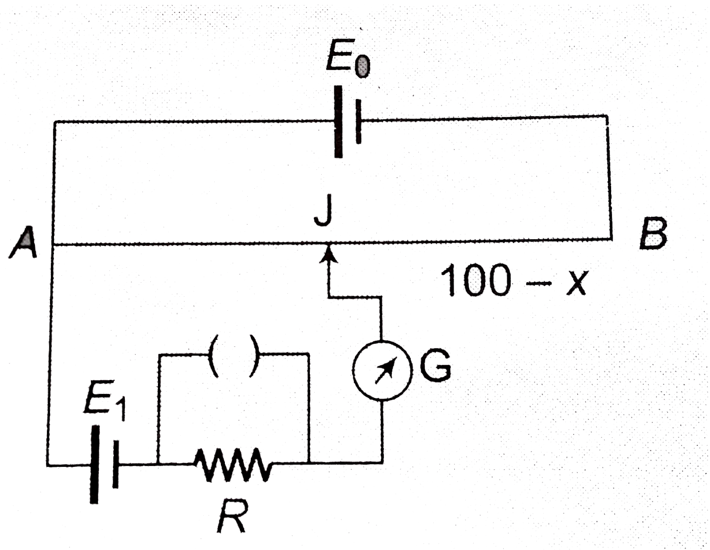
528.



The figure shows a potentiometer using a cell E of emf $2.0V$ and internal resistance 0.40Ω connected to a resistor wire AB. A standard cell of constant emf of $1.02V$ gives a balance point at $67.3cm$ length of the wire. A very high resistance $R = 100k\Omega$ is put in with the standard cell. This resistance is shorted by inserting switch S when close to the balance point. The standard cell is then replaced by a cell of unknown emf E and the null point turns out to be $82.3cm$ length of the wire.

(a) What is the value of E ?

(b) What is the purpose of using the high resistance R ?

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

(d) Is the null point affected by the internal resistance of the cell E ?

(e) Would this method work if

(i) the internal resistance of cell E were higher than the resistance of wire AB and

(ii) the emf of cell E were $1.0V$ instead of $2.0V$?

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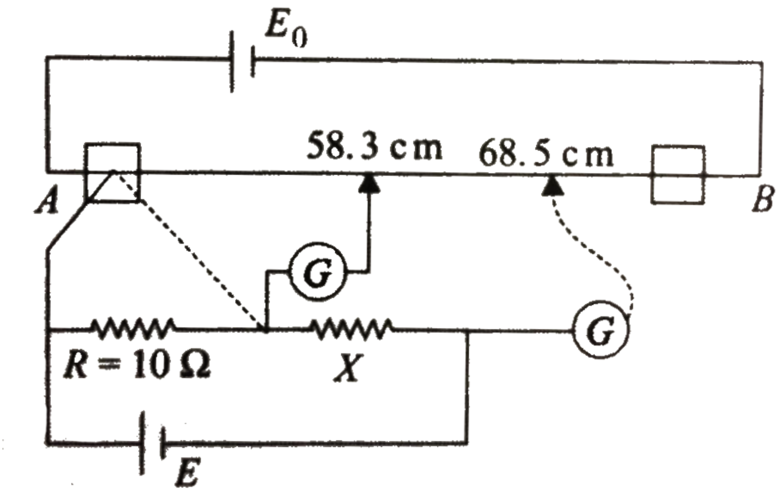
529. Figure 6.12 shows a potentiometer circular for comparison of two resistances. The balance point with a standard resistor $R = 10.0 Omeag$ is found to be $58.3cm$, while that with the unknows resistance X is $68.5cm$. Determine the value of X. What would you do if you fail to find a balance point with the given cell E?



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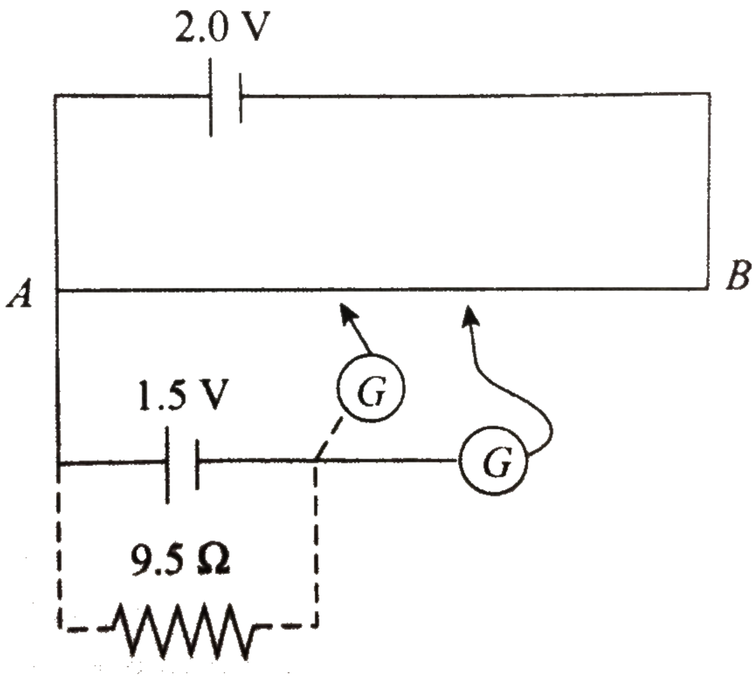
530. Figure 6.13 shows a $2.0V$ potentiometer used for the determination of internal resistance of a $1.5V$ cell. The balance point of the cell in open circuit is $76.3cm$. Whan a resistor of 9.5Ω is used in the external circuit of the cell, the balance point shifts to $64.8cm$, length of the potentiometer. Dentermine the internal resistance of the cell.



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

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

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

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

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535. For wiring in the home, one uses Cu wires or $A1$ wires. What considerations are involved in this ?

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536. Why are constantan and manganin used for making standard resistances?

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

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

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

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540. 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

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

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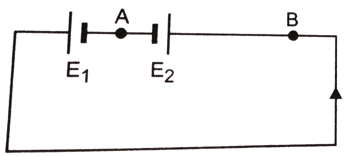
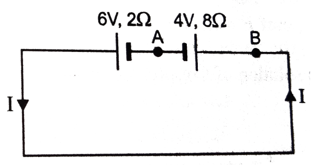
542. The circuit in Fig. shows two cells connected in opposition to each other. Cell E_1 is of emf $6V$ and internal resistance 2Ω, the cell E_2 is of emf $4V$ sand internal resistance 8ω. Find the potential difference between the points A and B.





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543. Two cells, having the same emf, are connected in series through an external resistance R. Cells have internal resistance r_1 and $r_2 (r_1 > r_2)$ respectively. When the circuit is closed, the potentail difference across the first cell is zero the value of R is

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544. Two conductors are made of the same material and have the same length. Conductor A is a solid wire of diameter $1mm$. Conductor B is a hollow tube of outer diameter $2mm$ and inner diameter $1mm$. Find the ratio of resistance R_A to R_B.

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545. Suppose there is a circuit consister of only resistance and batteries , suppose one is to double (or increase it to in n-times)all voltage and all resistances , shown thst currents are unalitered

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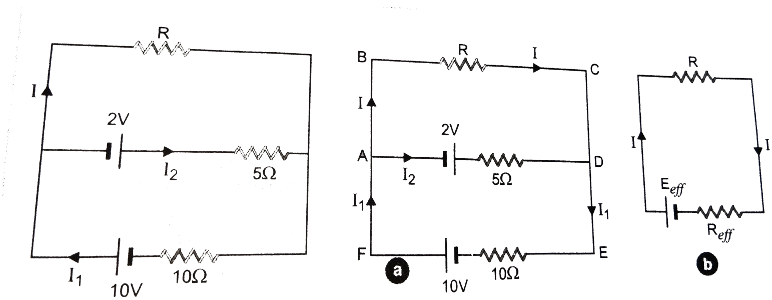
546. Two cells of voltage $10V$ and $2V$ and internal resistance 10Ω and 5Ω respectively , are connected in parallel with the pesition and of $10V$ battery connected to negative pole of $2V$ battery Find the effected voltage and effected resistance of the combination



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547. A room AC run for 5 hour at a voltage of $220V$ The wiring of the room constant of Cu of $1mm$ radius and a length of $10m$ consumption per day is 10 commerclal unit What fraction of it goes in the joule heated in wire? What would happen if the wiring is made of aluminum of the same distances?

$\left[\rho_{cu} = 1.7 \times 10^{-8}\Omega, \rho_{A1} = 2.7 \times 10^{-8}\Omega m\right]$

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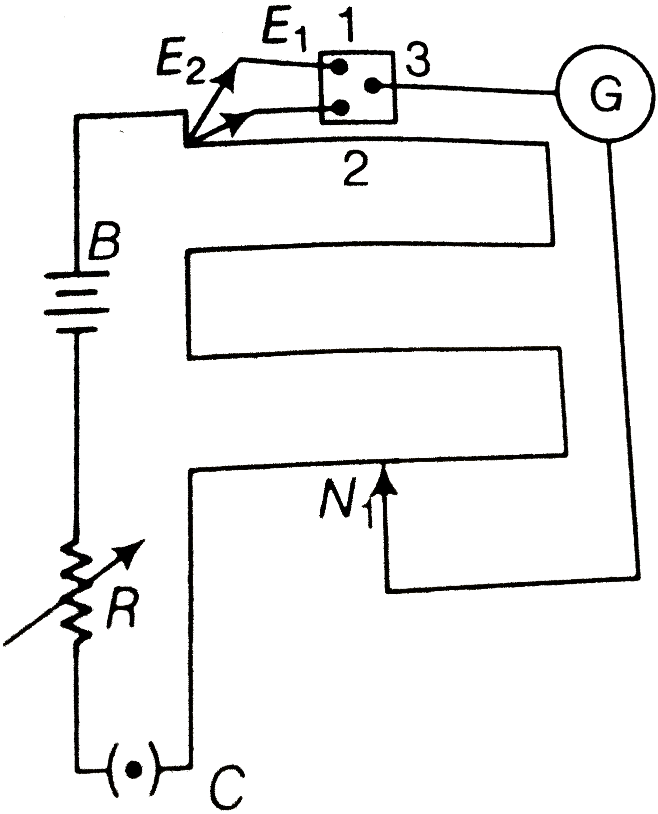

548.

In an experiment with a potentiometer, $V_B = 10V$. R is adjusted to the 50Ω (figure). A student wanting to measure voltage E_1 to a battery (approx. 8V) finds no null point possible. He then diminishes R to 10Ω and is able to locate the null point ont he last (4th) segment of the potentiometer. find the resistance of the potentiometer wire and potential drop per unit length across the wire in the second case.

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549. What is the momentum acquired by the electron in a wire of length 1 meter when a current of 1 ampere start floeing in wire ? The mass and charge of electron are m and arespectively

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550. At the temperature $0^{\circ} C$ the electron of conductor B is n times that of condoctor A temperaturte coefficient of resistance are equal to α_2 and α_1 respectively find the resistance and A temperaturte coefficient of resistance of a segment of these two condustore when they are conected in series

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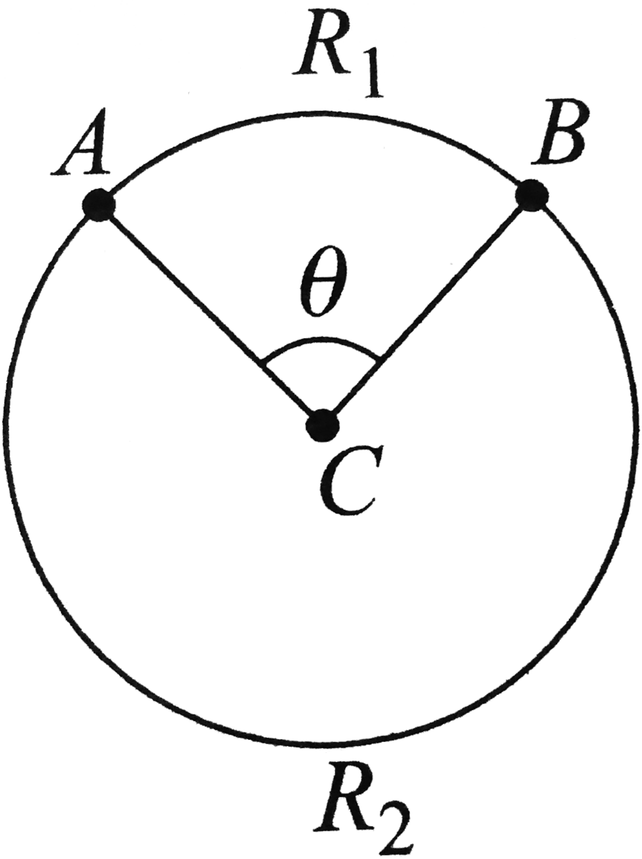
551. In a uniform ring of resistance R there are two points A and B such that $\angle ACB = \theta$, where C is the centre of the ring. The equivalent resistance between A and B is



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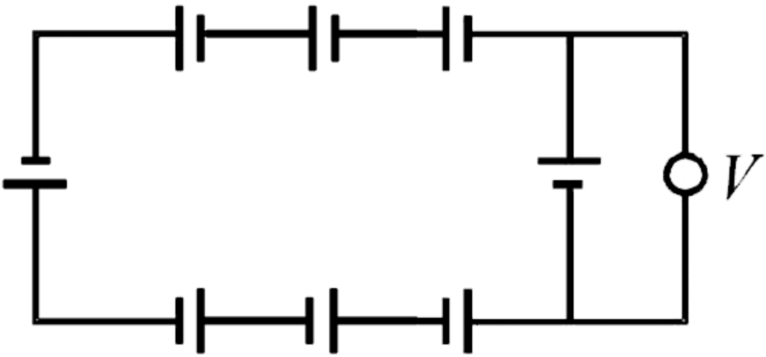
552. In the circuit shown below, each battery is 5V and has an internal resistance of 0.2 ohm.



The reading in the ideal voltmeter V is .

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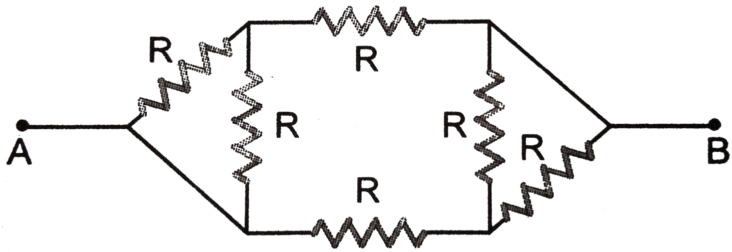
553. What is the equivalent resistance between A and B of network .Each resistance is of $R\Omega$



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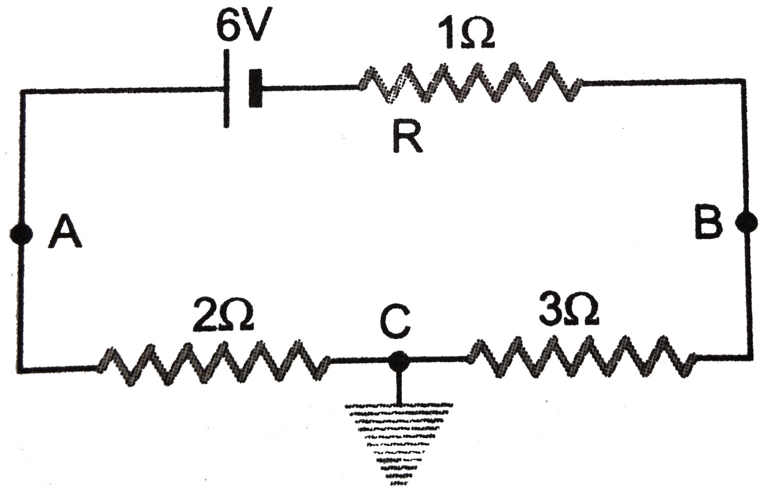
554. Determine the potentials of point A and B with respect to earth



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555. A few straings cells in series are to be charge from a $30V$ d.c. supply The end of each cutt is $1.35V$ and internal resistance is 0.1Ω The charging current is $3.0A$ in this arrangement how many calls can be charge and what extra resistance is required be the connected in the circuit ?

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

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557. A resistance is in the shape of a turnacated right circuit cone The radit are a and b $(b > a)$ the special resistance of the material is p and the alitude is h If laper is small then find the resistance between the plate faces of the resistor

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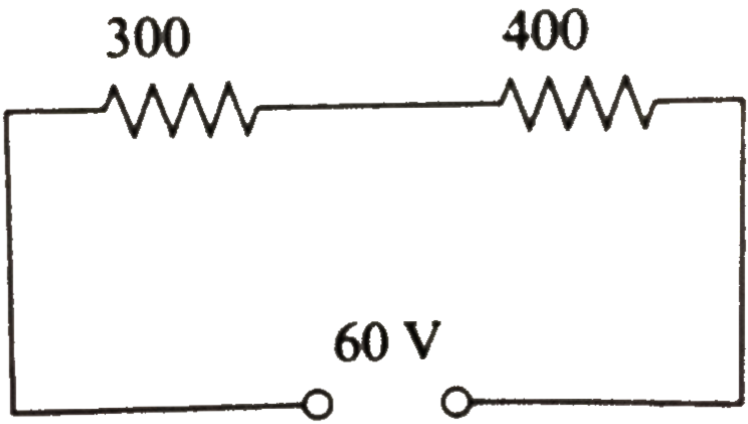
558. In the circuit shows in Fig. 6.22, a voltmeter reads $30V$ when it is connected across a 400ω resistance. Calculate what the same voltmeter would read when it is connected across the 300Ω

resistance.



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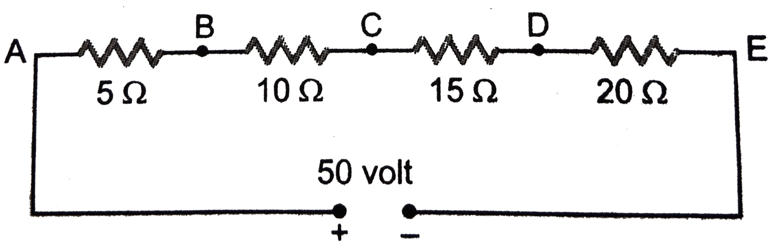
559. The point B in the circuit is earthed what will be the potential at point D?



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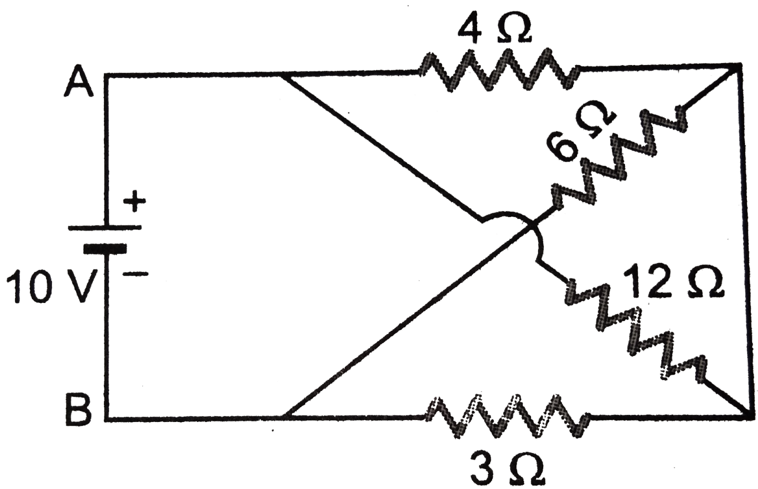
560. What is the equivalent resistance between A and B in the net work of resistance .Find the correct through 12Ω



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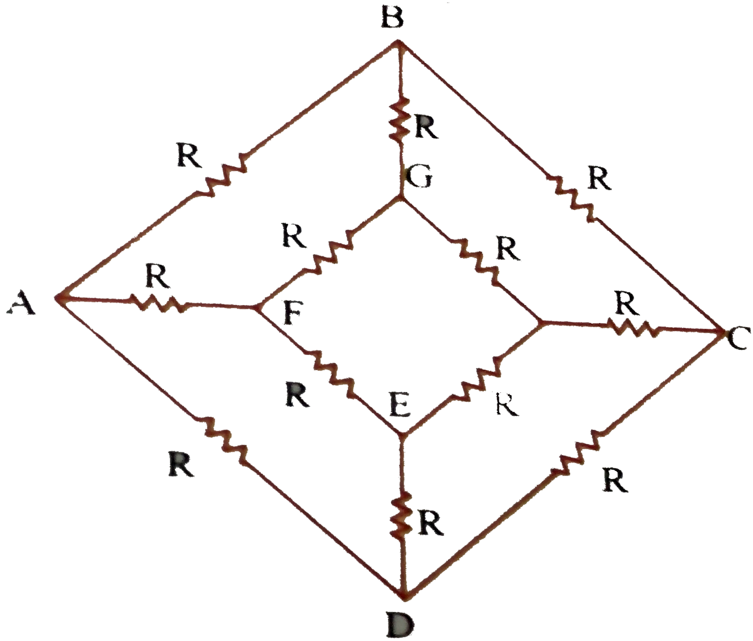

561.

Twelve resistances each of resistance R are connected in the circuit as shown in fig. Net resistance between points A and C would be

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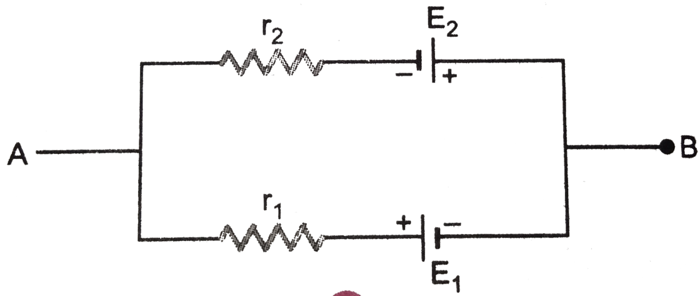
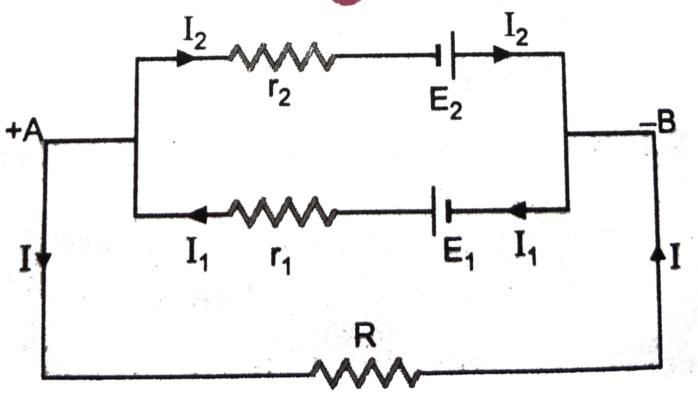
562. Find the $e.m.f(E_0)$ end internal resistance (r_0) of a simple battery which is equivalent to a perallel combination of two battery of $e.m.fE_1$ and E_2 and internal resistance v_1 and v_2 respectively with polarities



a



b

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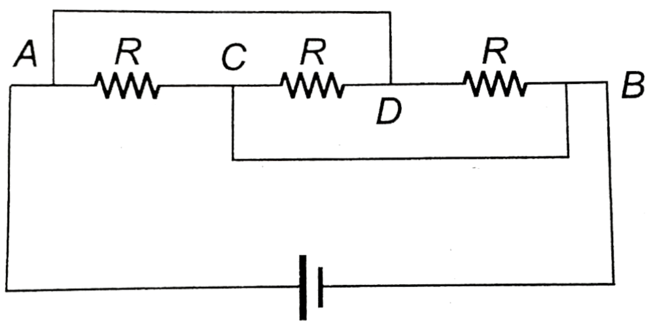
563. Three equal resistace, each of R ohm, are connectedd as shown in the figure. A battery of $2V$ and of internal resistance 0.1 ohm is connected across the circuit. The value of R for which the heat generated in the circuit maximum will be



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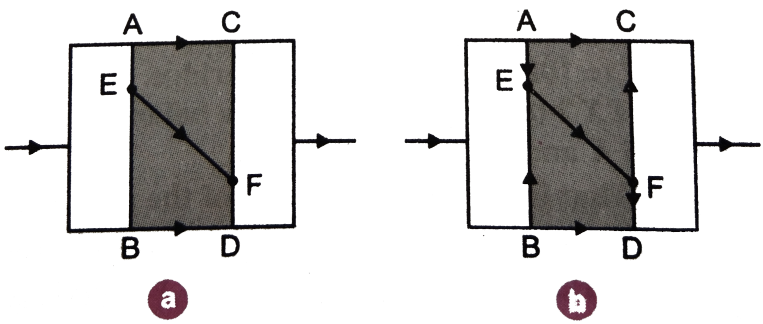
564. Two conductors AB and CD are inserted is an electric circuit .The point $A, B, C,$ and D are so choses that there is no current in the condition The conducters are then connected by a wire EF will any current flow in Ef, AB and CD?



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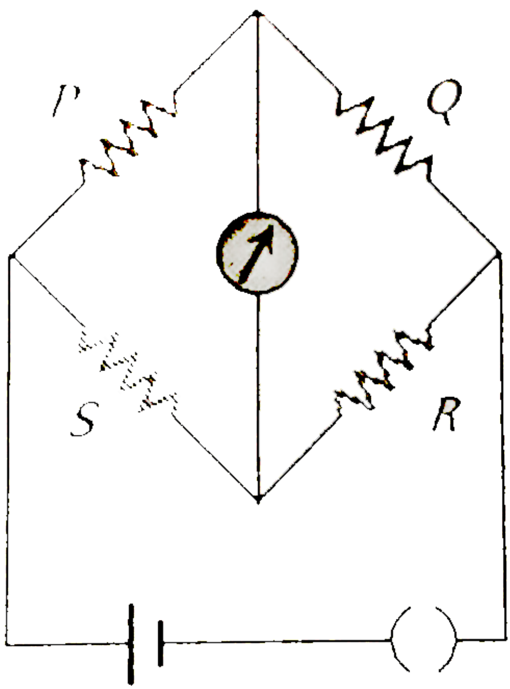
565. In the Wheatstone's bridge shown, $P = 2\Omega$, $Q = 3\Omega$, $R = 6\Omega$ and $S = 8\Omega$. In order to obtain balance, shunt resistance across S must be



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566. When resistres of resistyences R_1R_2 and R_3 are connected in series , then the resistanceR_1 is given by $R_1 = R_1 + R_2 + R_3$

In this arrengement the current through each resister is same hut potential difference across then is difference

When resitorce of resistance R_1R_2 and R_3 are connected in particle the effective resistance R_p is given by $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

In this arrangement , the potential difference across each resistance is but current through then is difference

Read the above passage and answer the

following question :

(i) Why does the effective resistance increase in series ?

(ii) Why does the effective resistance decrease in parallel ?

(iii) What basic value are displayed by the above study ?

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567. It is desired to supply a current of $2A$ through a resistance of 10Ω As many as 20calls are pravided each of $e.\ m.\ f.2V$ and resistance

0.5Ω Two friends Rajeev and sanjeev try their hand on the problem Rajeev success but sanjeev falls

Read the above passage and answer the following question:

(i) Justify the set tip up of Rajeev?

(ii) What neight have gone with sanjeev when he gets be gets $1.4A$ current in the external load?

(iii) What are the basic value shown by Rajeev and sanjeev in their work ?

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568. Sarita a house wife had been using in his house an inverter and a lead acit battery set for the last two year ,soddenly she felt problem of low voltage and less back up from inverter instead of calling an electrician , she tried to set it right .On checking notes that the level of electrolyte was less than required in the battery to ralse the electroles to required level After doing on she notes that above that battery was permanely damamged

(i) What wrong was done by sarita ?

(ii) What was the right way for sarita to gas rid of the problem ?

(iii) What do you learn from the above study?

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Conceptual Problems

1. Does the emf represnet a force or potential energy or work done per unit charge or potential differences?

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2. Clarify your elementary notions about current in a metallic conductor by answering the following queries :

(a) The electron drift speed is estimated to be only a few mms^{-1} for currents established almost the instant a circuit is closed?

(b) The electron drift arises due to the force experienced by electons in the electric field inside the conductor. But force should cause acceleation. Why then do the electrons acquire a steady drift speed?

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

(d) When electrons drift in a metal from lower to higher potential, does it mean that all the "free" electrons of the metal are moving in the same direction ?

(e) Are the paths of electons straight lines between successive collisions (with the positive ions of the metal) in the (i) absence of electic filed, (ii) presence of electic field.

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3. (a) Write the nature of path of free electrons in a conductor in the (i) presence of electric field (ii) absence of electric field.

(b) Between two successive collisions each free electron acquires a velocity from 0 to v where $v = \frac{eE}{m}\tau$. What is the average velocity of a free electron in the presence of an electric field.

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Short Q/A

1. Three materials A, B and C have electrical conductivities $\sigma, 2\sigma$ and 2σ respectively. Their numbers densities of free electrons are 2 n, n and 2n respectively. For which material is a average collision time of free electrons maximum?

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2. What is the end error in meter bridge ? How do you remove it?

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Very short Q/A

1. Are Kirchhoff's rules applicable to both a.c. and d.c. ?

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2. Why is a meter bridge also called a slide wire bridge ?

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3. When is Wheatstone Bridge most sensitive ?

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4. What are two pratical forms of Wheatstone bridge ?

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5. What do you mean by sentiveness of a Wheatstone bridge ?

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6. Why is a potentiometer named as potentiometer ?

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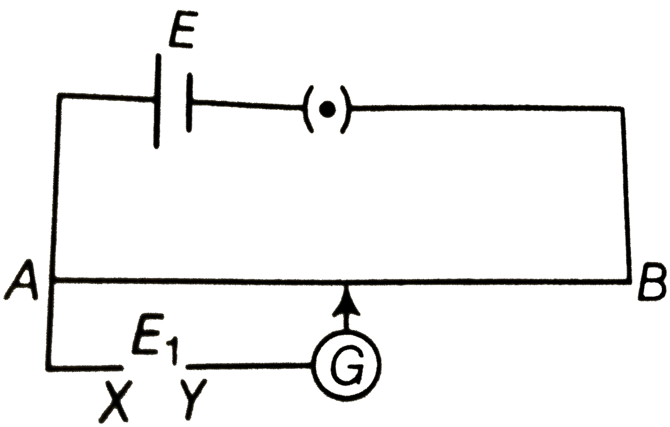
7. 

While doing an experiment with potentiometer (figure) it was found that the deflection is one sided and (i) the deflection decreased while moving from one and A of the wire, to the end R, (ii) the deflection increased, while the jockey was moved towards the end D.

(i). Which terminal positive or negative of the cell E_1 is connected at X in case (i) and how is E_1, related to E?

(ii). Which terminal of the cell E_1 is connected at X in case (1 in 1)?

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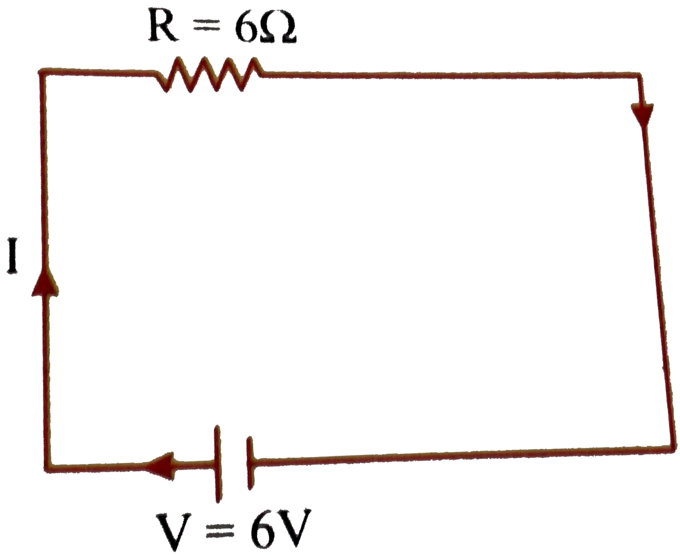
Long Q/A

1. 

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

(b) electrons give up energy at the rate of RI^2 per second tot he thermal energy. What time scale would number associate with energy in problem (a)? $n =$ number of electron/volume $= \frac{10^{29}}{m^3}$ length of circuit $= 10cm$, cross-section $A = (1mm)^2$

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Value based

1. As is rubber and wood are insulatores there are no free electron or currecnt carrless to then .Therefore carrect can and not flow through then On the other hand human body and earth are good conductor A current of $10mA$ or more passing thought human body can be fated A current will flow only if the circuit is complete

Read the above passage and answer the following position:

(i) How can one repair on free line wires?

(ii) Why is a current of $10 mA$ or more passage though human body fated?

(iii) What is the practical utility of this study?

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2. The resistively of a condu is given by the expression : $p = RA/l$ where R is the independent of dimension of conductor it deped on the meters of material and temperature of condections

Read the show paragraph and answer the following question:

(i) For whichmeterial is the resistivity (i) zero (ii) infinite ?

(ii) Find the resistent of a bellow cylindrical of the meterial of cylinderical pipe is $2 \times 10^{-3} \Omega m$

(iii) How is the knowinledge of resistance metel in over dally life ?

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Exercise

1. A Steady current flows in a metallic conductor of non uniform cross section. The quantity/quantities which remain constant along the length of the conductor is/are

A. current electric field and drift velocity

B. drift speed only

C. current and drift speed

D. current only

Answer: D

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2. A current of $4.4A$ is flowing in a copper wire of radius $1mm$ density of copper is $9 \times 10^3 kgm^{-3}$ and its atoms is $63.5u$ If every atoms of copper contributes one condition electron , then the drift velocity of electrons is nearly [density of copper $9 \times 10^3 kgm^3$]

A. $0.1mms^{-1}$

B. $0.5mms^{-1}$

C. $1mms^{-1}$

D. $1.5 mms^{-1}$

Answer: A

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3. An electron of hydrogen atoms is considered to be revolving round the proton in the circuit orbit of radius $\frac{h^2}{2\pi^2 me^2}$ with velocity $\frac{2\pi e^2}{h}$ the equivalent current due to circuiting charge is

A. $\frac{4\pi^2 me^4}{h^3}$

B. $\frac{4\pi^2 me^5}{h^3}$

C. $\dfrac{4\pi^2 m^2 e^4}{h^3}$

D. None of above

Answer: b

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4. The electron of a hydrogen atom revolves the proton in a circuit nth of radius $r_0 = \dfrac{\in_0 n^2 h^2}{\pi m e^2}$ with a speed $v_0 = \dfrac{e^2}{2 \in_0 nh}$ The current to circulating charge is proportional to

A. e^2

B. e^3

C. e^5

D. e^6

Answer: C

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5. A metal wire is subjected to a constant potential difference When the temperaturre of the metal in it wire increase the drift velocity of the electrons in it .

A. increase, thermal velocity of the electrons decrease

B. decrease, thermal velocity of the electrons decrease

C. increase, thermal velocity of the electrons increase

D. decrease, thermal velocity of the electrons increase

Answer: d

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6. The mean free path of electrons in a metal is $4 \times 10^{-8} m$ The electric field which can give on an average $2eV$ energy to an electron in the metal will be in the units V/m

A. 5×10^{-11}

B. 8×10^{-11}

C. 5×10^{7}

D. 8×10^{7}

Answer: C

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

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

A. $22C$

B. $20C$

C. $18C$

D. $5C$

Answer: A

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8. A uniform copper wire of length $1m$ and cross section area $5 \times 10^{-7} m^2$ carries a current of $1A$. Assuming that are 8×10^{28} free electron per m^3 in copper, how long will an electron take to drift from one end of the wire an electron the other. Charge on an electron $= 1.6 \times 10^{-19} C$

A. $1.6 \times 10^3 s$

B. $3.2 \times 10^3 s$

C. $6.4 \times 10^3 s$

D. $8.0 \times 10^3 s$

Answer: c

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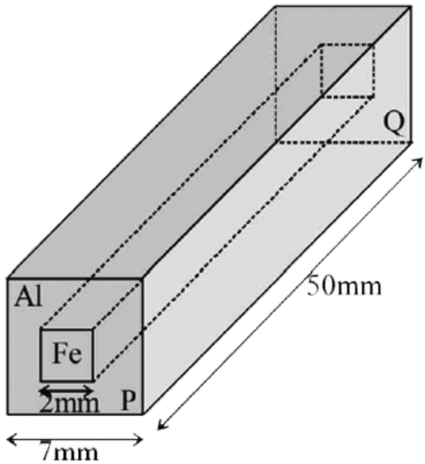
9. In an aluminium (Al) bar of square cross section, a square hole is drilled and is filled with iron (Fe) as shown in the figure. The electrical resistivities of Al and Fe are $2.7 \times (10^{-8}) \Omega m$ and $1.0 \times (10^{-7}) \Omega m$, respectively. The electrical resistance between the two faces P and Q of the composite bar is



A. $\frac{2475}{64}\mu\Omega$

B. $\frac{1875}{64}\mu\Omega$

C. $\frac{1875}{49}\mu\Omega$

D. $\frac{2475}{132}\mu\Omega$

Answer: b

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

A. $1/2$

B. $1/4$

C. $1/6$

D. $1/8$

Answer: D

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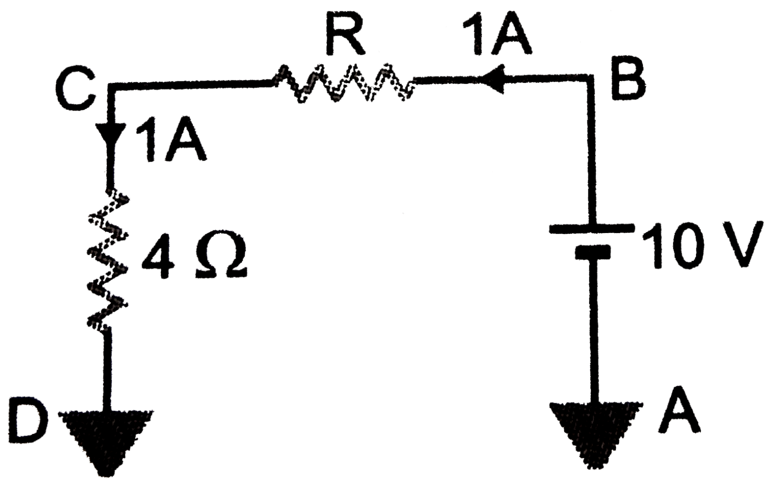
11. The potential at point B and C and the value of resistance R are



A. $10V, 4V, 4\Omega$

B. $6V, 4V, \Omega$

C. $10V, 4V, 6\Omega$

D. $6V, 4V, 4\Omega$

Answer: c

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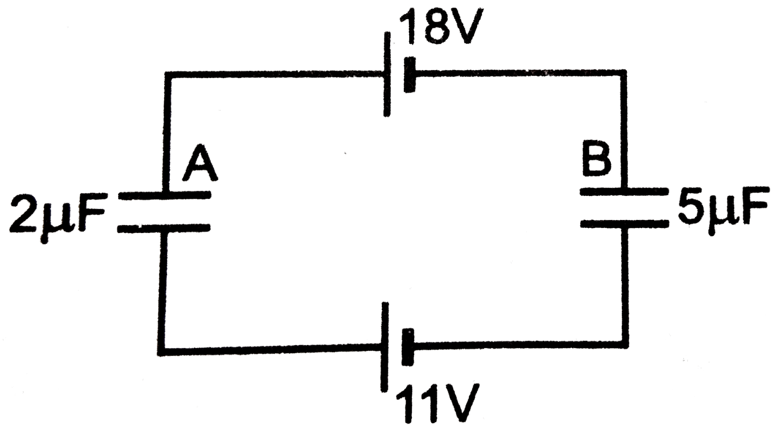
12. Two capacitors A and B of capacitances $2\mu F$ and $5\mu F$ are connected to two battery as shown in figure The potential difference in volt between the plate of A is



A. 2

B. 5

C. 7

D. 18

Answer: b

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13. 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. nR

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

C. n^2R

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

Answer: C

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14. Copper and iron wire of same length and diameter are in series and connected acress a battery .The resistance of copper is about one sixth of that of iron If E_1 and E_2 are the electron fields of in the copper and iron wires respectively then which of the following is correct ?

A. $E_1 < E_2$

B. $E_1 = E_2 \neq 0$

C. $E_1 > E_2$

D. $E_1 = E_2 = 0$

Answer: a

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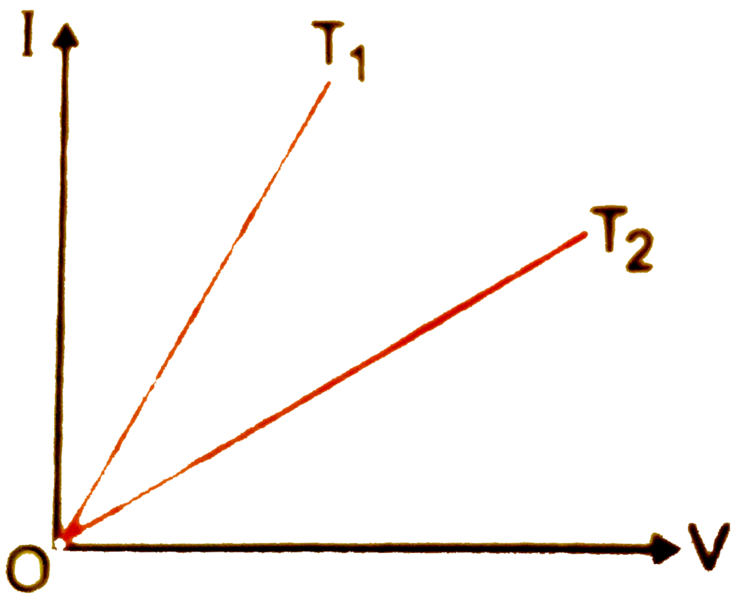
15. V- I graph for a metallic wire at two different temperature T_1 and T_2 is shown in figure. Which of the two temperature is higher and why?



A. $\cos 2\theta$

B. $\sin 2\theta$

C. $\cot 2\theta$

D. $\tan 2\theta$

Answer: C

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16. When 5 V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is $2.5 \times 10^{-4} ms^{-1}$. If the electron density in the wire is $8 \times 10^{28} m^{-3}$, the resistivity of the material is close to :

A. $1.6 \times 10^{-8} \Omega m$

B. $1.6 \times 10^{-7} \Omega m$

C. $1.6 \times 10^{-6} \Omega m$

D. $1.6 \times 10^{-5} \Omega m$

Answer: d

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17. At $0^{\circ}C$ the electron of conductor of a conductor B is n times that of conductor A temperature coefficient of resistance for A and B are α_1 and α_2 respectively the temperature coefficient of resistance of a circuit segment constant A and B in series is

A. $\dfrac{n\alpha_1 + n\alpha_2}{1+n}$

B. $\dfrac{n\alpha_1 - n\alpha_2}{1+n}$

C. $\dfrac{\alpha_1 + n\alpha_2}{1+n}$

D. $\dfrac{\alpha_2 + n\alpha_1}{1+n}$

Answer: C

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18. Following the above question the temperature coefficient of resistance of a circuit segment containing A and B in parallel is

A. $\dfrac{n\alpha_1 + n\alpha_2}{1+n}$

B. $\dfrac{n\alpha_1 - n\alpha_2}{1+n}$

C. $\dfrac{\alpha_1 + n\alpha_2}{1+n}$

D. $\dfrac{\alpha_2 + n\alpha_1}{1+n}$

Answer: D

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

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

C. $\dfrac{\alpha_1 + \alpha_2}{2}, \dfrac{\alpha_1 + \alpha_2}{2}$

D. $\frac{\alpha_1 + \alpha_2}{2}, \alpha_1 + \alpha_2$

Answer: c

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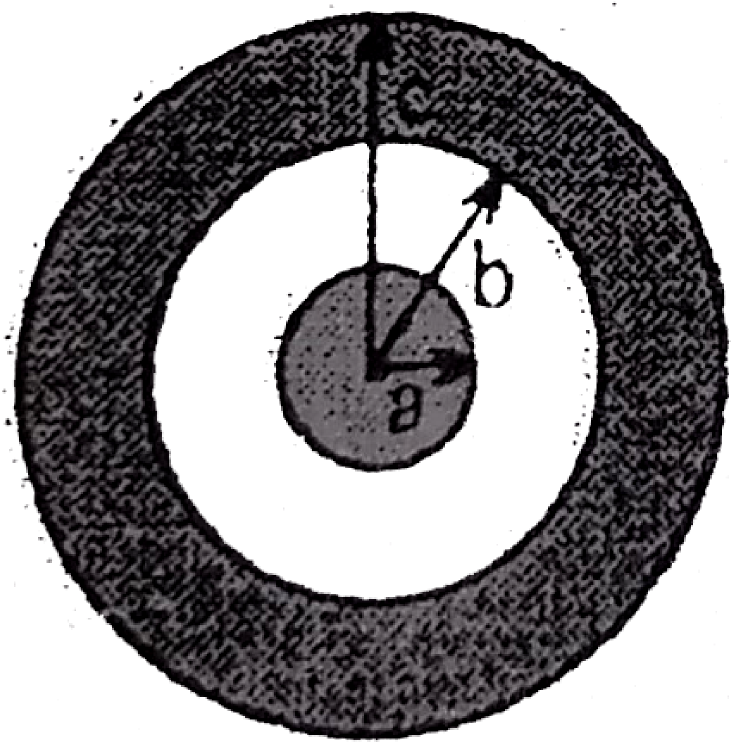
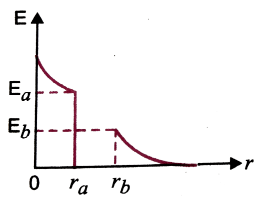
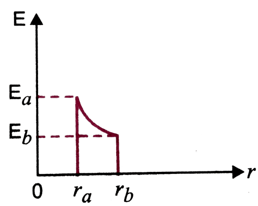
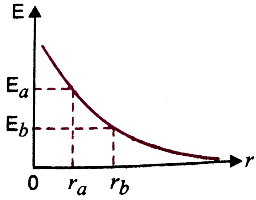
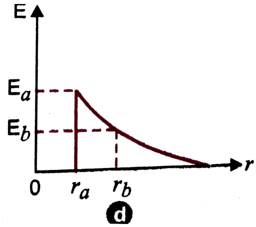
20. A nonconducting sphere with radius a is concentric with and surrounded by a conducting spherical shell with inner radius b and outer radius c. The inner sphere has a negative charge uniformly distributed throughout its volume, while the spherical shell has no net charge. The potential V (r) as a function of distance from the center is given by



A. 

B. 

C. 

D. 

Answer: b

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

A. linear increase for Cu, linear for Si

B. linear increase for Cu, exponential increase for Si

C. linear increase for Cu, exponential decrease for Si

D. linear decrease for Cu, linear decrease for Si

Answer: c

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

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

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

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

Answer: b

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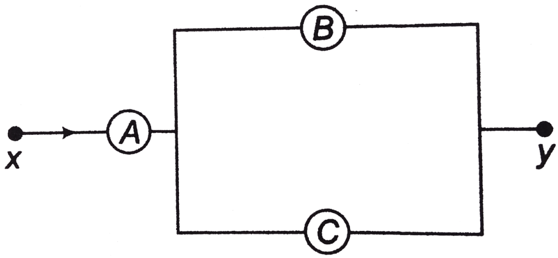
23. A, B and C are voltmeters of resistances $R, 1.5R$ and $3R$ respectively. When some potential difference is applied between x and y the voltmeter readings are $V_A, V_B$and $V_C,$ then



A. $V_A \neq V_B = V_C$

B. $V_A = V_B \neq V_C$

C. $V_A \neq V_B \neq V_C$

D. $V_A = V_B = V_C$

Answer: D

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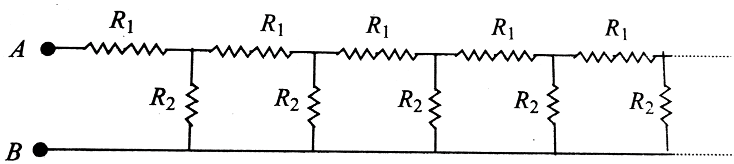
24. Consider an infinite ladder of network shown In fig 5.223. A voltage is applied between points A and B. If the voltage is halved after each section, find the ratio of R_1 / R_2.

Suggest a method to terminate it after a few sections without introducing much error in its attenuation.



A. $1:2$

B. $2:1$

C. $1:1$

D. $2:3$

Answer: B

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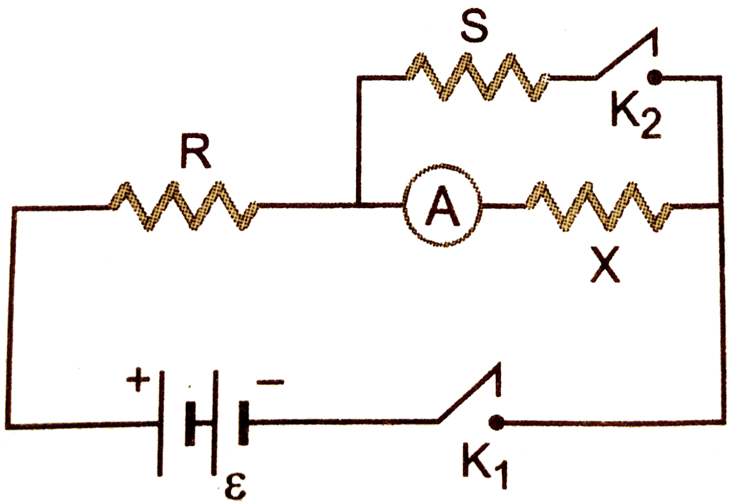
25. The reading of an ammeter in the circuit



(i) I when key K_1 closed key K_2 is open

(ii) $I/2$ when both keys K_1 and K_2 are closed

Find the expression for the resistance of X in terms of the resistances of R and S

A. $100, 50$

B. $50, 100$

C. $0, 100$

D. $0, 50$

Answer: d

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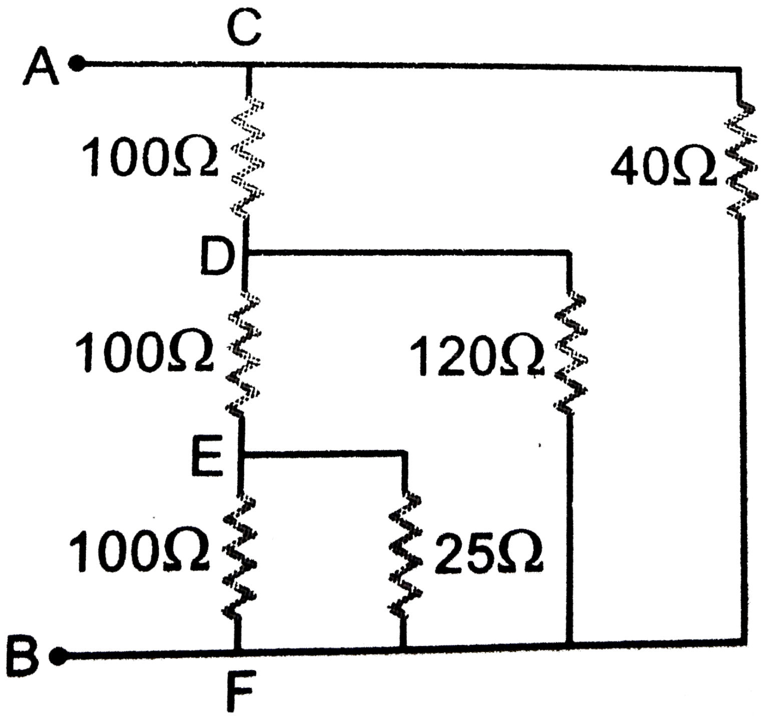
26. In the circuit AB is a long wire of 300Ω it is tapped at one third distance and is connected as shown The equivalent resistance between A and

B is



A. 60Ω

B. 32Ω

C. 20Ω

D. None of above

Answer: B

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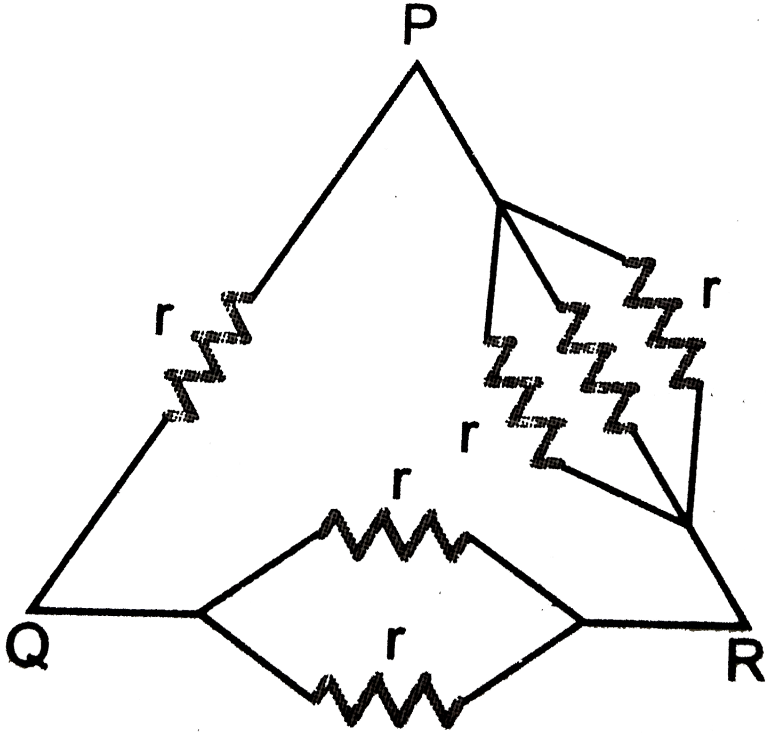
27. Six equal resistance are connected between point P, Q and R Then net resistance will be maximum between



A. P and Q

B. Q and R

C. P and R

D. any two point

Answer: A

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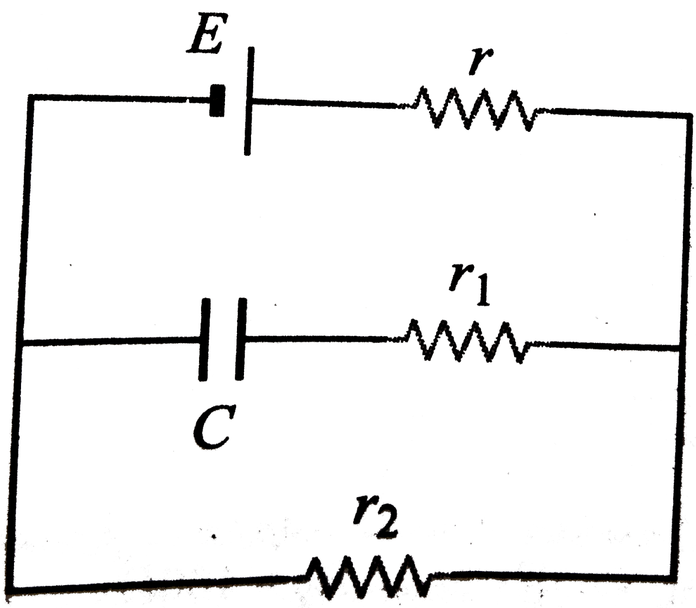
28. In the given circuit digram when the current reaclies steady state in the circuit , the charge an the capacity of capacitance C will be



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

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

C. CE

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

Answer: a

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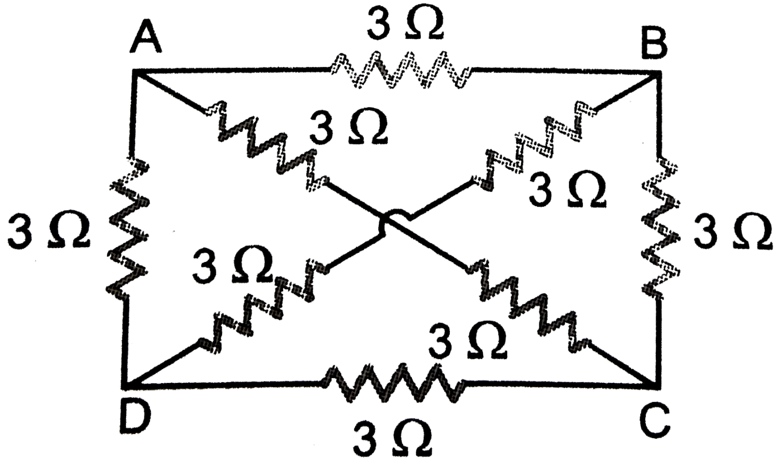
29. The resistance between point A and C below is



A. 3Ω

B. 4Ω

C. 2Ω

D. 8Ω

Answer: C

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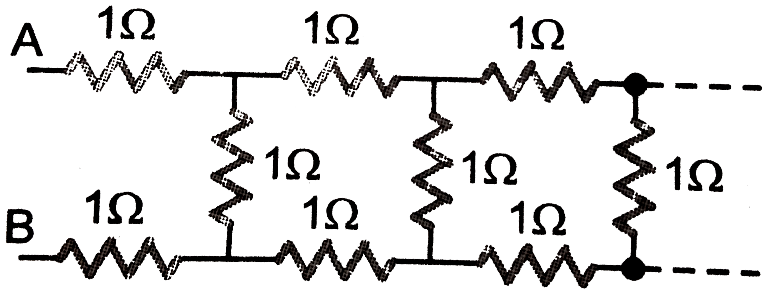
30. The resistance between the terminal point A and B of the given infinitely long circuit will be



A. $(\sqrt{3}-1)$

B. $(1-\sqrt{3})$

C. $(1+\sqrt{3})$

D. $(2+\sqrt{3})$

Answer: c

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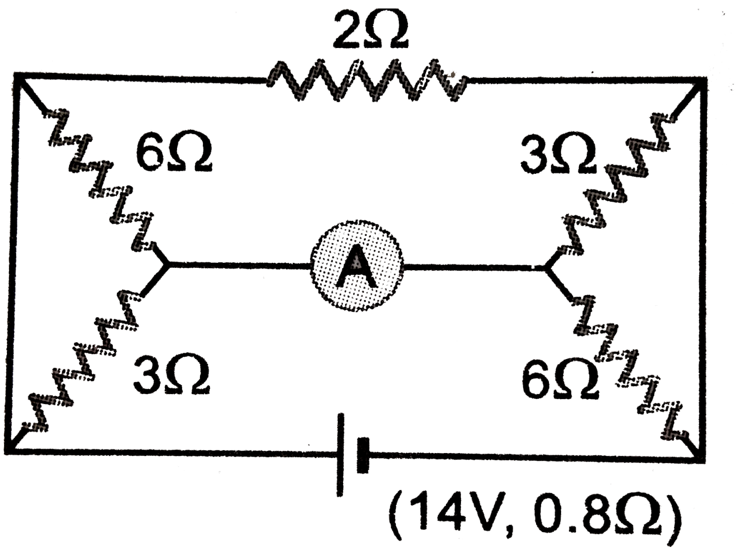
31. The reading of ammeter



A. $6.56A$

B. $3.28A$

C. $2.18A$

D. $1.09A$

Answer: C

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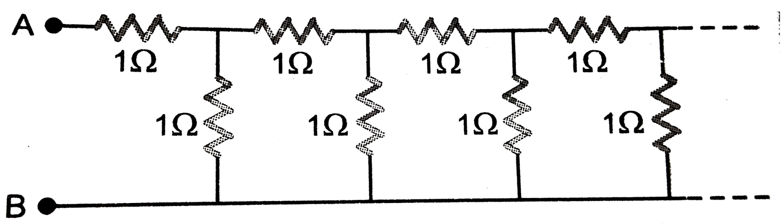
32. The equivalent resistance between point A and B of an infinite net work of resistances each of 1Ω connected



A. infinite

B. 2Ω

C. $\frac{1+\sqrt{3}}{2}$

D. zero

Answer: c

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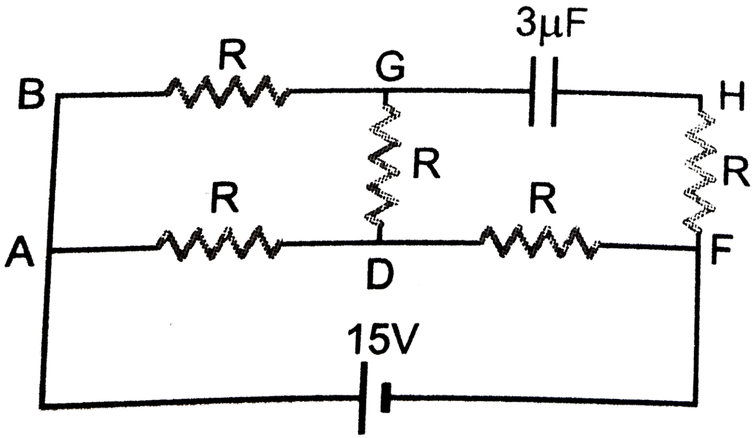
33. In the circuit shown the cell is idea with end $= 15V$ each resistance is of 3Ω The potential difference the capacitor is



A. zero

B. $9V$

C. $12V$

D. $15V$

Answer: C

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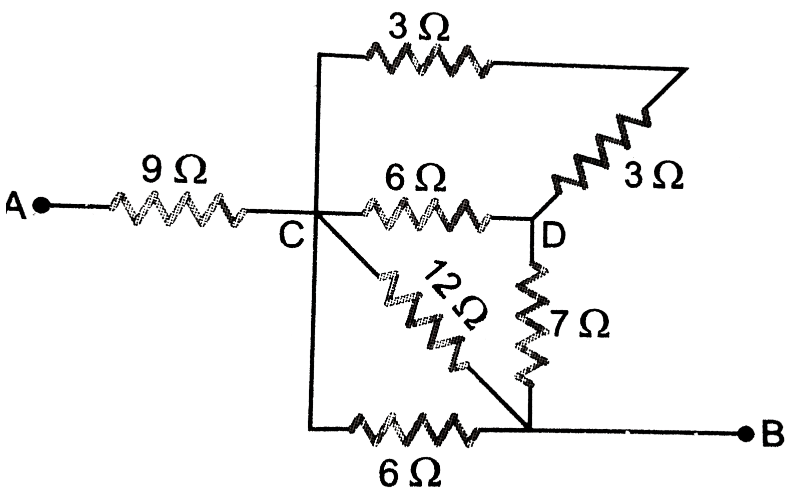
34. The equivalent resistance between point A and B for the combination of resistance



A. 9.9Ω

B. 11.9Ω

C. 12.9Ω

D. 13.9Ω

Answer: b

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35. 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. $27:32:35$

B. $54 : 64 : 75$

C. $9 : 16 : 25$

D. $4 : 9 : 16$

Answer: b

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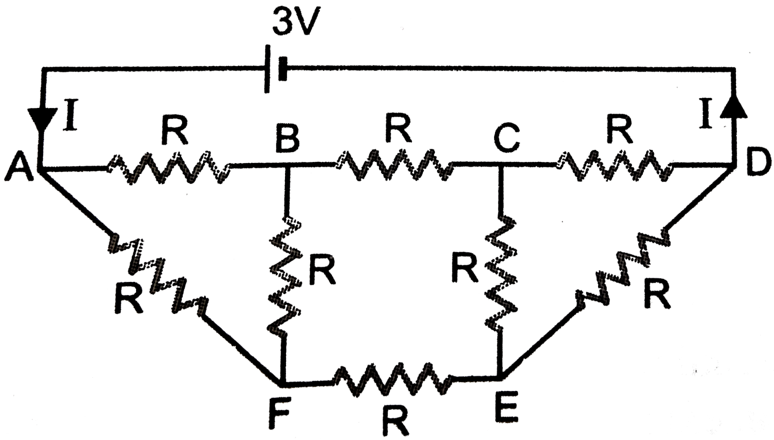
36. Shows a network of eight resistors battery of resistance $R(= 2\Omega)$ connected in a $3V$ battery of negligible internal resistance. The current I in the circuit is



A. $0.25A$

B. $0.50A$

C. $0.75A$

D. $1.0A$

Answer: d

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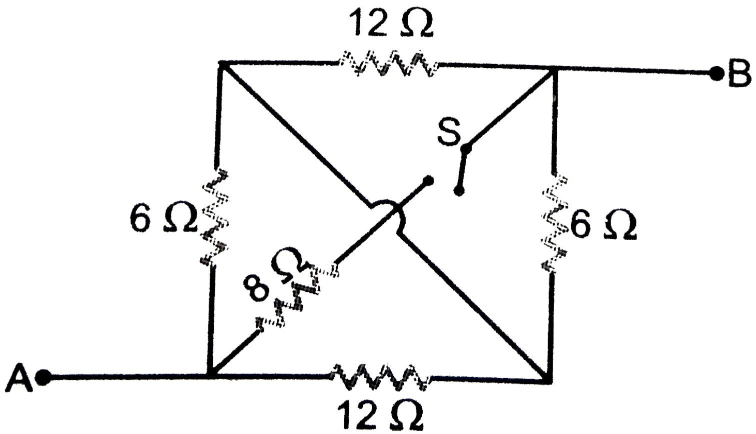
37. The equivalent resistance between point A and B with swich S open and closed are resistance



A. 4Ω, 8Ω

B. 8Ω, 4Ω

C. 6Ω, 9Ω

D. $9\Omega, 6\Omega$

Answer: b

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38. A galvanometer of resistance G is shunted by a resistance S ohm. To keep the main current in the circuit uncharged, the resistance to be put in series with the galvanometer

A. $\frac{G^2}{(S+G)}$

B. $\frac{SG}{(S+G)}$

C. $\dfrac{S^2}{(S+G)}$

D. $\dfrac{G}{(S+G)}$

Answer: A

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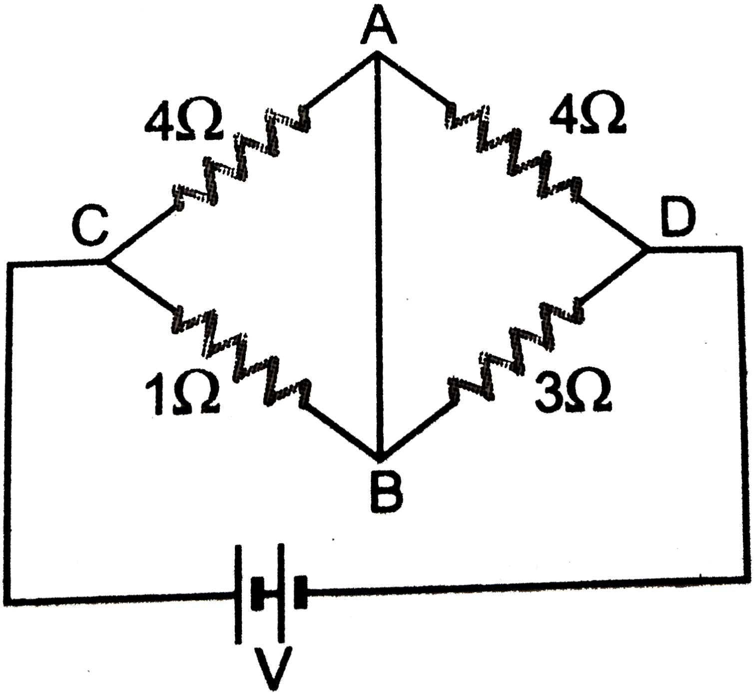
39. In the circuit of a condacting wire is connected between point A and B the current is this wire will



A. flow from B to A

B. flow from A to B

C. flow in the direction which will be decided

by the value of V

D. flow be zero

Answer: a

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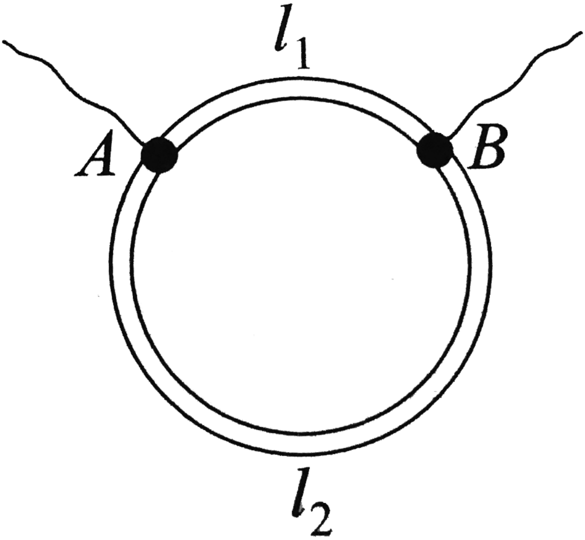
40. A ring is made of a wire having a resistance $R_0 = 12\Omega$. Find the point A and B, as shown in the figure, at which a current carrying conductor should be connected so that the resistance R of the subcircuit between these points is equal to

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



A. $\frac{l_1}{l_2} = \frac{5}{6}$

B. $\frac{l_1}{l_2} = \frac{1}{3}$

C. $\frac{l_1}{l_2} = \frac{3}{8}$

D. $\frac{l_1}{l_2} = \frac{1}{2}$

Answer: d

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41. The internal resistance of primary cell is 4Ω it generater a current of $0.2A$ in which chemical resistance connected is providing the current is

A. $0.42J/s$

B. $0.24J/s$

C. $5J/s$

D. $1J/s$

Answer: D

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42. A student measure the terminal potential difference (V) of a cell (of emf internal energy is connected in providing the circuit is

A. $-r$ and ε

B. r and $-\varepsilon$

C. $-\varepsilon$ and r

D. ε and $-r$

Answer: a

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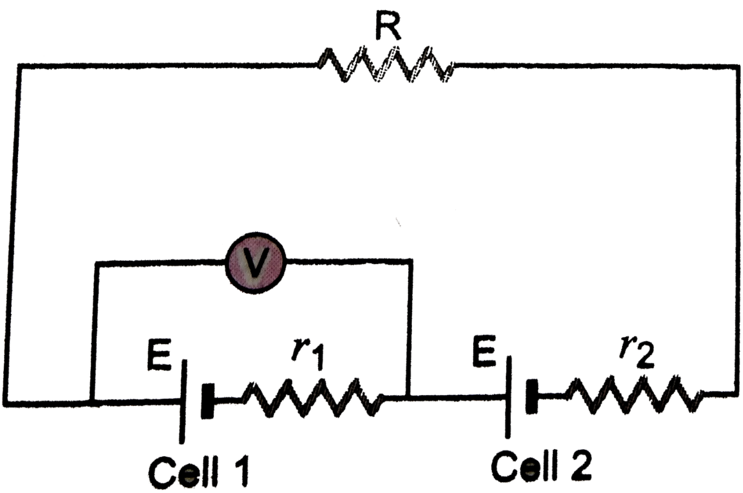
43. In the circuit cell are of equal $emf E$ but of difference internal resistance $r_1 = 6\Omega$ reading of the ideal voltmeter connected across cell 1 is zero The value of the external resistance R is ohm is equal to



A. 10Ω

B. 4Ω

C. 2Ω

D. 2.4Ω

Answer: c

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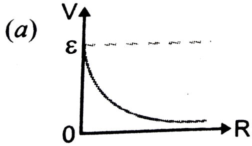
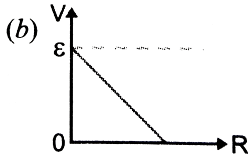
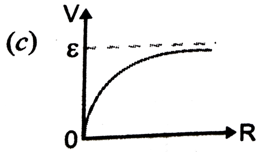
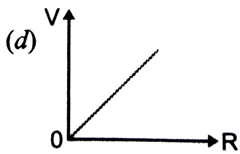
44. Cell having an $emf\varepsilon$ internal resistance r is connected a variable external resistance R As the resistance R is increased the piot of potential difference V across R is given by

A. 

B. 

C. 

D. 

Answer: c

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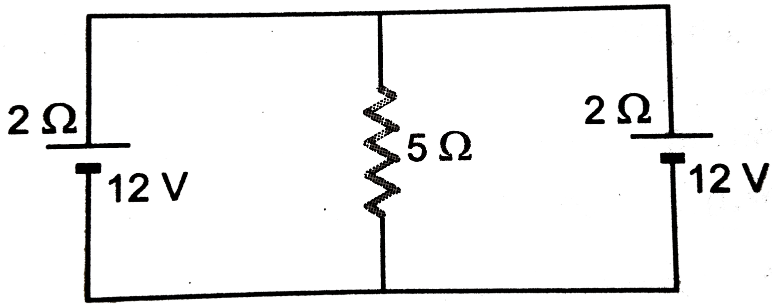
45. In the arrangement the current through 5Ω resistor is



A. $2A$

B. zero

C. $\dfrac{12}{7}A$

D. $1A$

Answer: a

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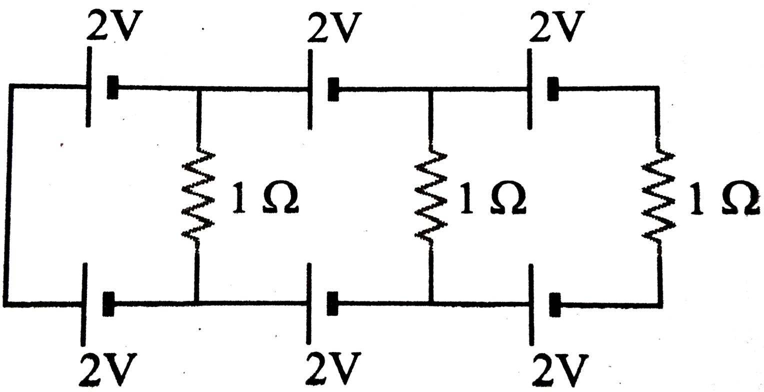
46. In the following circuit the current in each resistance is



A. $0.5A$

B. $0A$

C. $1A$

D. $0.25A$

Answer: b

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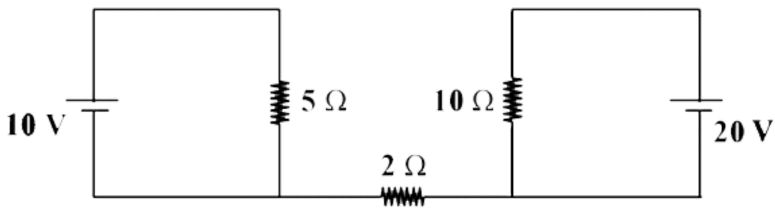
47. Find out the value of current through 2Ω resistance for the given circuit.



A. $5A$

B. $2A$

C. zero

D. $4A$

Answer: c

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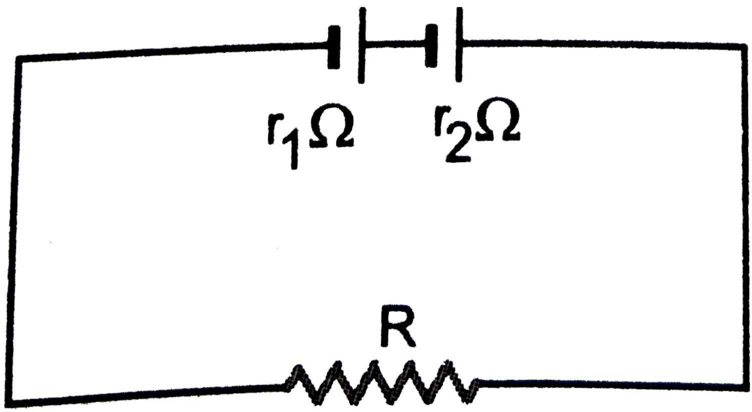
48. Two cell with the same e.m.f. E and difference internal resistance r_1 and r_2 are connected in series to an external resistance R a value of R be selected such that the potential difference as the flow cell E should be zero when



A. $R = r_1 + r_2$

B. $R = r_1 - r_2$

C. $R = r_1 / r_2$

D. $R = r_1 = r_2$

Answer: b

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49. Twelve cells each having the same e.m.f are connected in series and are kept to a closed box. Some of the cell are connected in reverse order .The battery is connected in series with an ammeter an external resistance R and two cells of the same type as an in the battery .The current when they and support each other is 3 ampere and current is 2 ampare when the two oppose each other. How many cells are connected in servese order ?

A. 1

B. 2

C. 3

D. 4

Answer: a

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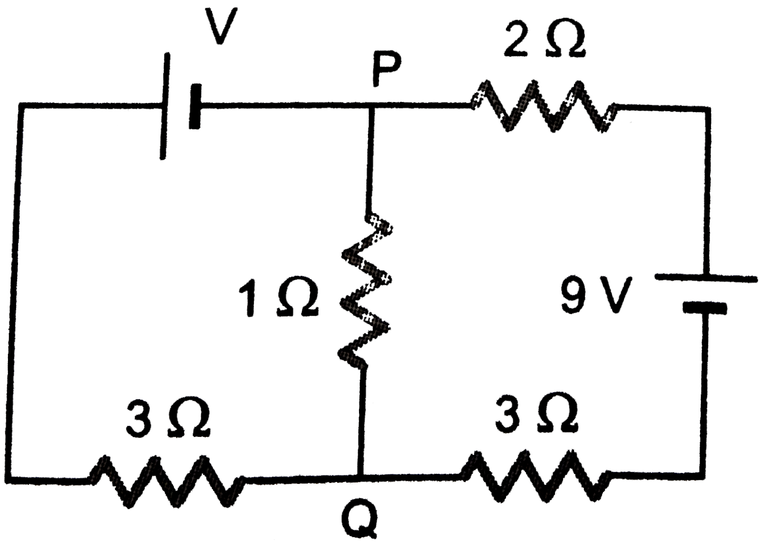
50. In the circuit shown, the currect in the 1Ω resistor



A. $1.3A$ from P to Q

B. $0A$

C. $0.13A$ from Q to P

D. $0.13A$ from P to Q

Answer: c

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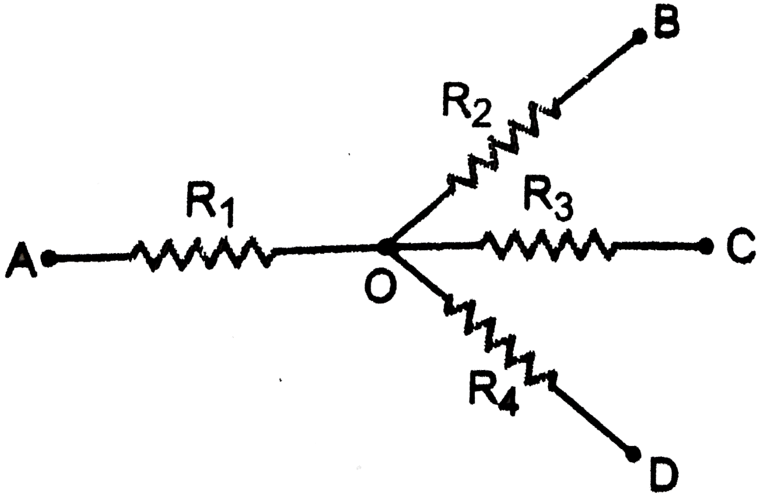
51. In the $R_1 = 10\Omega$, $R_2 = 20\Omega$, $R_3 = 40\Omega R_4 = 80\Omega$ and $V_A = 5V, V_B = 10V, V_c = 20V, V_D = 15V$ The current in the resistance R_1 will be



A. $0.4A$ toward O

B. $0.4A$ away from O

C. $0.8A$ toward O

D. $0.8A$ toward O

Answer: b

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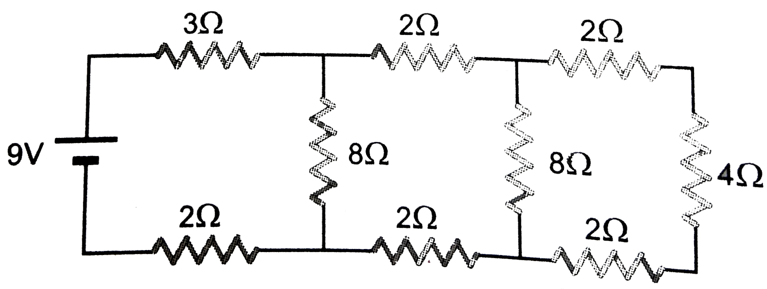
52. In the circuit shown in the circuit through



A. the 3Ω resistor is $0.50A$

B. the 3Ω resistor is $0.25A$

C. the 4Ω resistor is $0.50A$

D. the 4Ω resistor is $0.25A$

Answer: d

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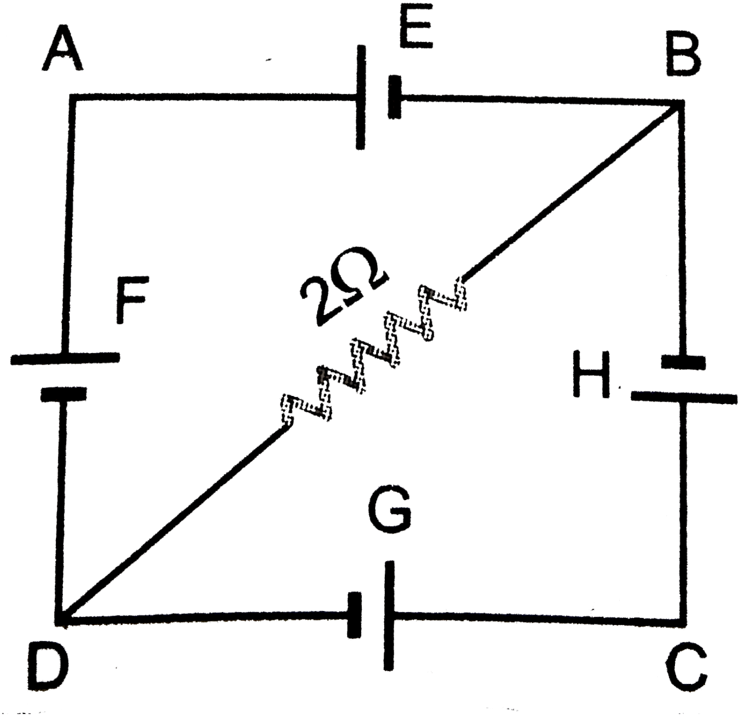
53. In the circuit E, F, G, H are cell of emf $2, 1, 3$ and 1Ω respectively .The potential difference across the terminal of each of the cell G and H

are



A. $1.46V, 1.61V$

B. $1.61V, 1.46V$

C. $2.52V, 1.61V$

D. $1.61V, 2.25V$

Answer: b

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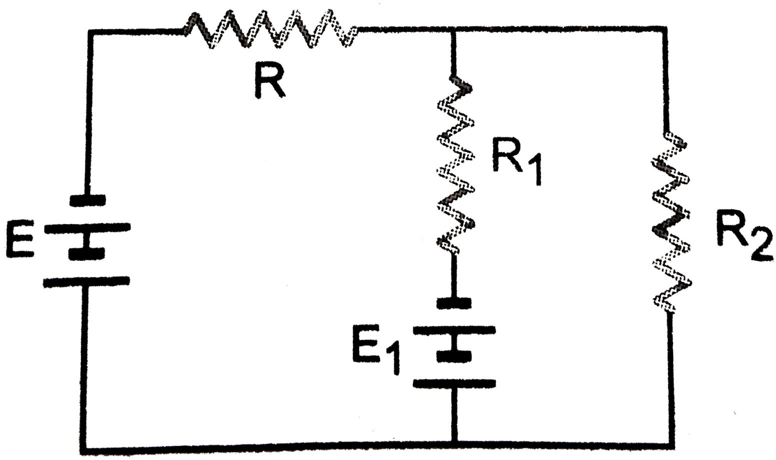
54. Shown a circuit with known resistance R, R_1 and R_2 neglect the resistance of the conducting wires and internal resistance of current source The magnitude of electrotive force E_1 each that the currect l through the resistance R in zero will be



A. $E\left(\frac{R_2}{R_1}\right)$

B. $E\left(\frac{R_1}{R_2}\right)$

C. $E\left(\frac{R_1+R_2}{R_2}\right)$

D. $E\left(\frac{R_1}{R_1+R_2}\right)$

Answer: c

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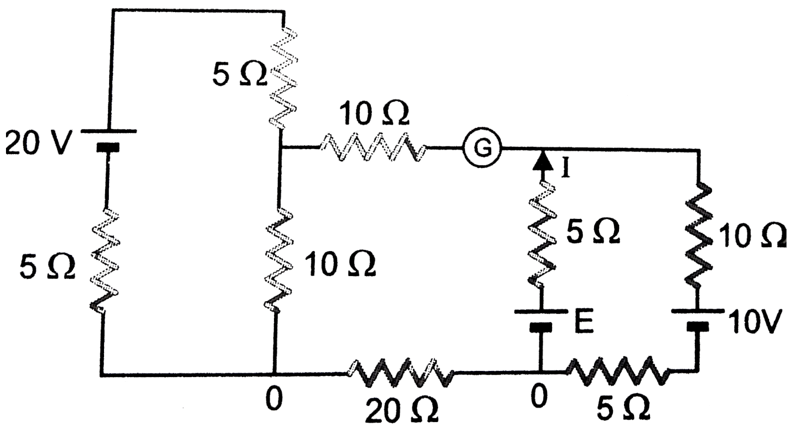
55. What would be the value of E so that the galvanometer G circuit shown on deflection



A. $5V$

B. $10V$

C. $15V$

D. $20V$

Answer: B

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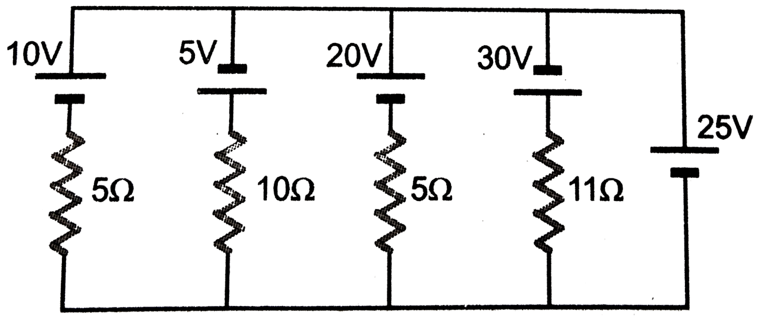
56. In the circuit shown in figure the current flowing through 25 V cell is



A. $7.2A$

B. $6A$

C. $12A$

D. $14.2A$

Answer: c

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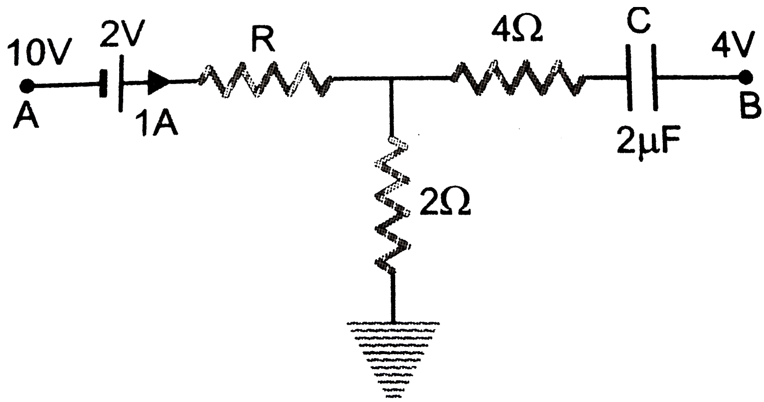
57. A network of resistance cell and capacitor $C(=2\mu F)$ is In steady state condition the change on $2\mu F$ capacity is Q while R is unknown resistance value of Q and R are resistance



A. $2\mu C \text{ and } 2\Omega$

B. $4\mu C \text{ and } 4\Omega$

C. $4\mu C \text{ and } 10\Omega$

D. $8\mu C \text{ and } 4\Omega$

Answer: c

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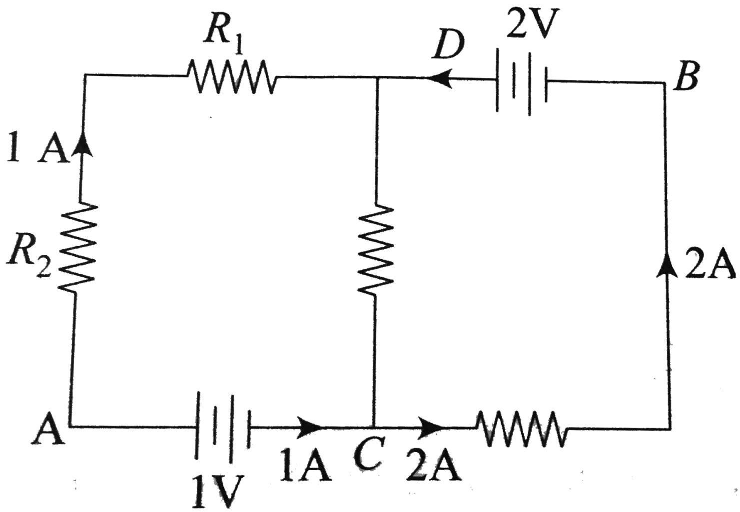
58. In the circuit shown in the figure, if potentail at point A is taken to be zero, the potential at point B is



A. $-1V$

B. $+2V$

C. $-2V$

D. $+1V$

Answer: d

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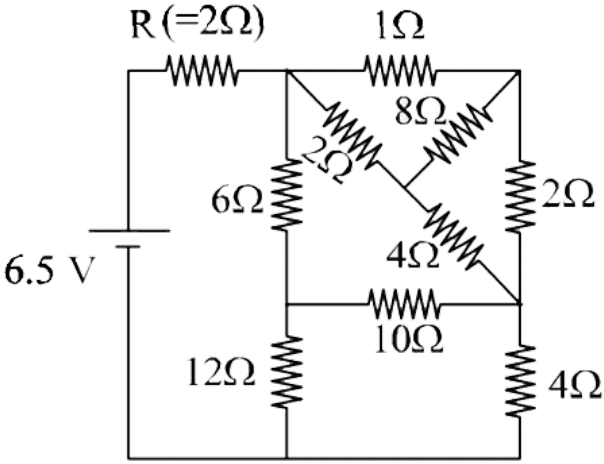
59. In the following circuit, the current through the resistor $R(=2\Omega)$ is I amperes. The value of I is



A. $1A$

B. $2A$

C. $2.5A$

D. $5.5A$

Answer: a

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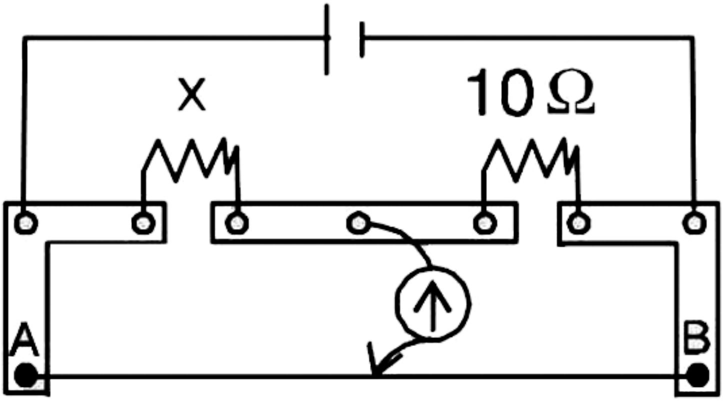
60. A meter bridge is set up as shown, to determine an unknown resistance X using a standard 10 ohm resistor. The galvanometer shows null point when tapping -key is at 52 cm mark. The end-corrections are 1 cm and 2 cm respectively for the ends A and B. The determine

value of X is



A. $10.2 ohm$

B. $10.6 ohm$

C. $10.8 ohm$

D. $11.1 ohm$

Answer: b

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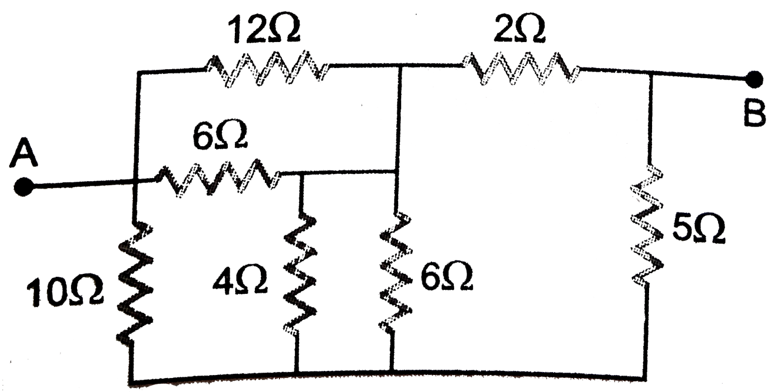
61. Seven resistances are connected The equivalent resistance of this network in between point A and B is



A. 7.2Ω

B. 3.6Ω

C. 8.6Ω

D. 4.3Ω

Answer: d

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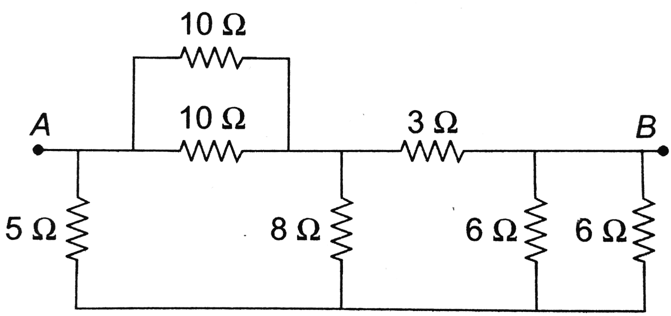
62. Seven resistance are connected as shown in the firgure. The equivalent resistance between A and B is



A. 3Ω

B. 4Ω

C. 4.5Ω

D. 5Ω

Answer: b

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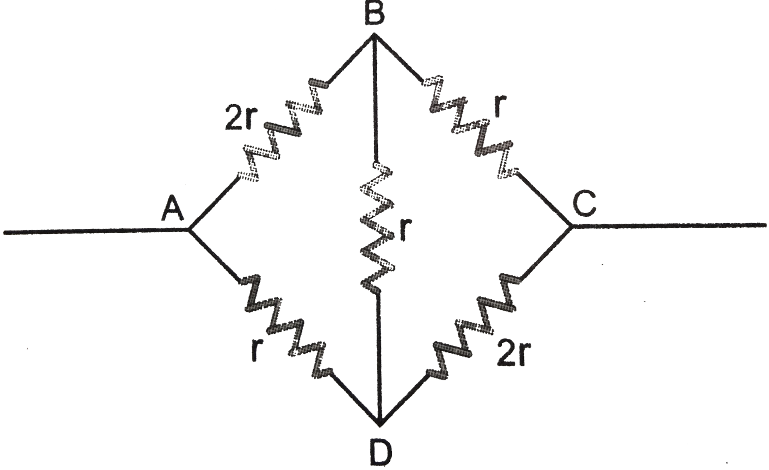
63. In the circuit the resistance between A and C is



A. $7r / 5$

B. r

C. $3r / 5$

D. $r / 5$

Answer: a

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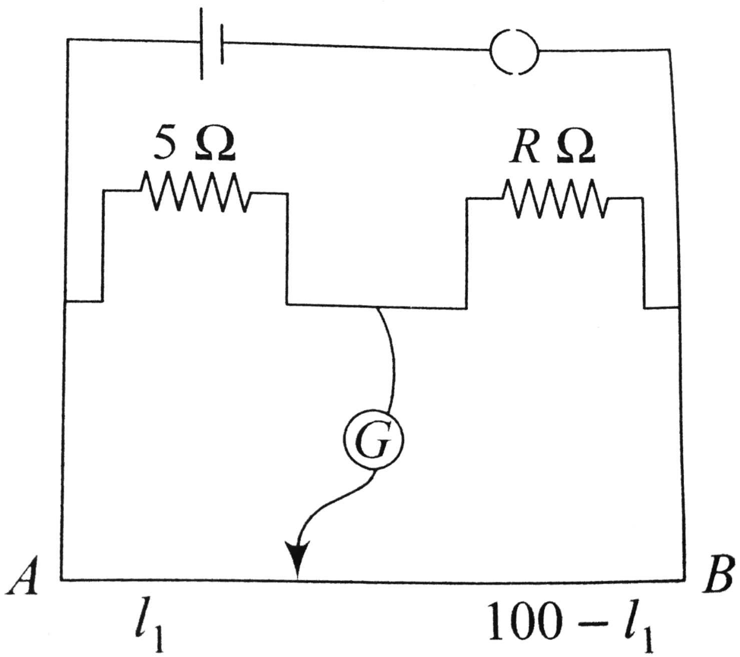
64. The resistance in the two arms of the meter bridge are 5Ω and $R\Omega$, respectively. When the resistance R is shunted with an equal resistance, the new balance point is $1.6l_1$.

The resistance R is



A. 10Ω

B. 19Ω

C. 20Ω

D. 25Ω

Answer: b

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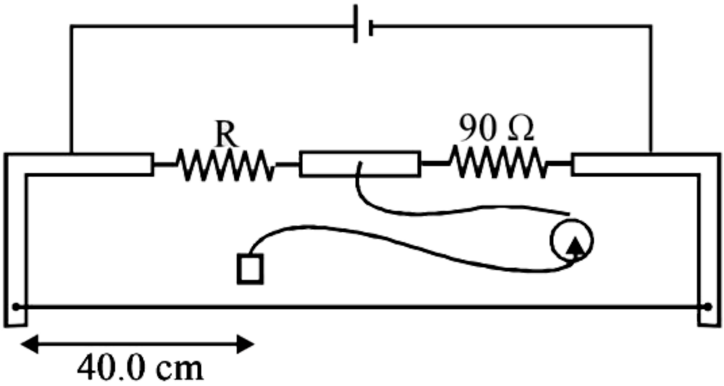
65. During an experiment with a metre bridge, the galvanometer shows a null point when the jockey is pressed at $40.0cm$ using a standard resistance of 90Ω, as shown in the figure. The least count of the scale used in the metre bridge is 1mm. The unknown resistance is



A. $60 \pm 0.15 \Omega$

B. $135 \pm 0.56 \Omega$

C. $60 \pm 0.25 \Omega$

D. $135 \pm 0.23 \Omega$

Answer: c

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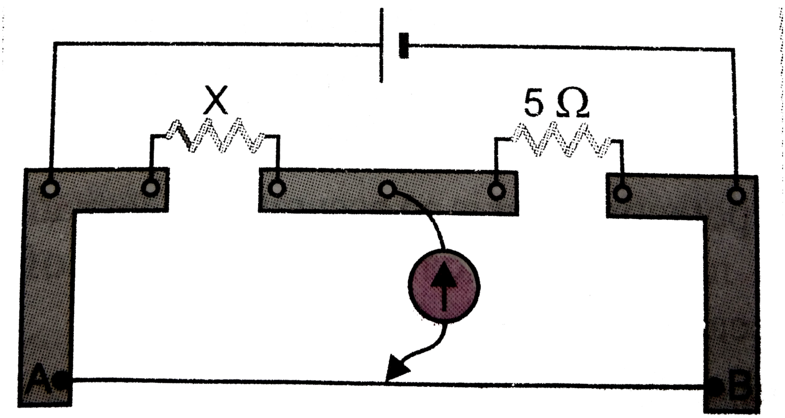
66. A meter bridge is set up is as shown determine as unknown resistance X using a standerd $5ohm$ resistor The galvanometer shown nall point when topping key is at $44cm$ mark The end corections see $1cm$ and $2cm$ respectively for the ends A and B The determine value of X is



A. $4.12 ohm$

B. $3.88 ohm$

C. $4.22 ohm$

D. $4.77 ohm$

Answer: b

Watch Video Solution

67. A resistance of 2Ω is connected across one gap of a meter bridge (the length of the wire is $100 cm$ and an unknown resistance, greater than

2Ω, is connected across the other gap. When these resistance are interchanged, the balance point shifts by $20cm$. Neglecting any corrections, the unknown resistance is.

(a)3Ω

(b) 4Ω

(c) 5Ω

(d) 6Ω.

A. 3Ω

B. 4Ω

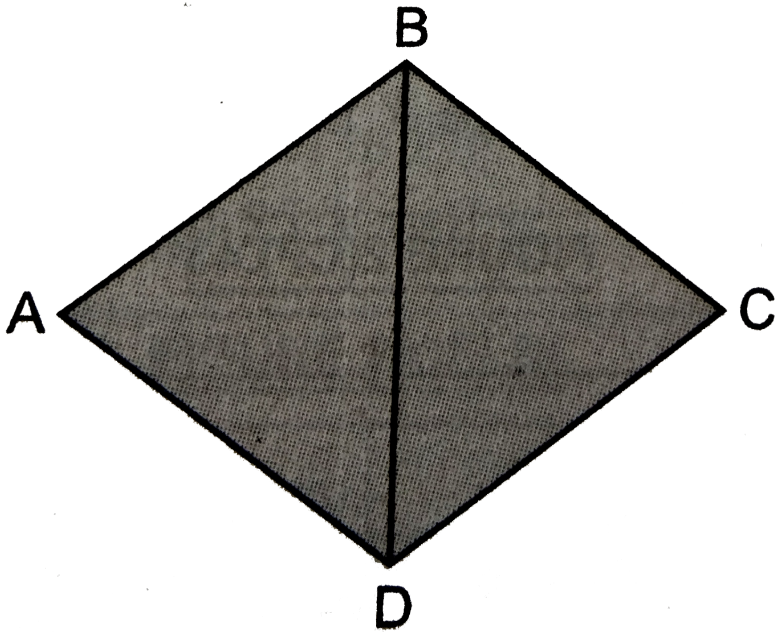
C. 5Ω

D. 6Ω

Answer: a

Watch Video Solution

68. A uniform wire of resistance R is stretched uniform in a times R is then cut to from five as The effective resistance between A and C is



A. $\frac{n^2 R}{3}$

B. $\frac{n^2 R}{5}$

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

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

Answer: b

Watch Video Solution

69. 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. $\dfrac{LE_0r}{(r+r_1l)}$

B. $\dfrac{E_0r}{lr_1l}$

C. $\dfrac{E_0r}{(r+r_1l)}\cdot\dfrac{1}{L}$

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

Answer: C

Watch Video Solution

70. A potentiometer is an accurate and versatile devices to make electrical measurement of $E.M.F.$ become the method involves

A. cells

B. potential gradients

C. a coundition of no current flow through the galvanmeter

D. a coundition of cells galvanmeter resistance

Answer: C

Watch Video Solution

71. 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. 40Ω

B. 44Ω

C. 48Ω

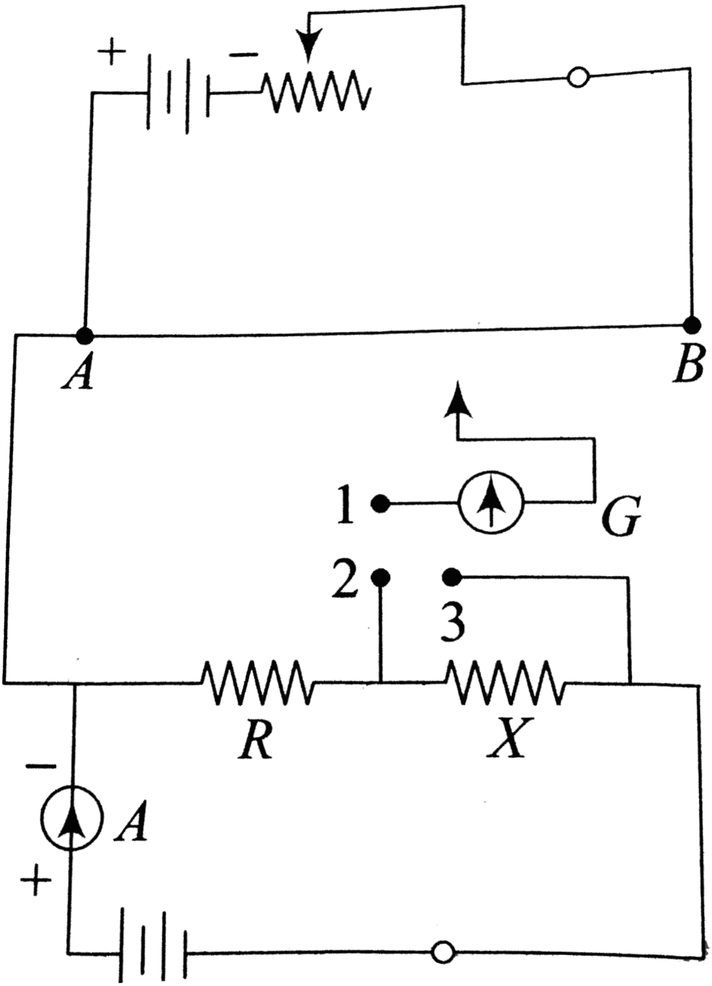
D. 52Ω

Answer: d

Watch Video Solution

72. A potentiometer circuit is setup as shown. The potential gradient across the potentiometer wire is $k\text{volt}/cm$ and the ammeter present in the circuit reads. $1.0A$ When two-way key is switched off. The balance point, when the key between the terminals (i) 1 and 2 (ii) 1 and 3, is plugged in, are found to be at lengths l_2cm and l_2cm respectively. The magnitudes, of the resistors R

and X, in ohm, are then, 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

Watch Video Solution

73. 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. 0.65Ω

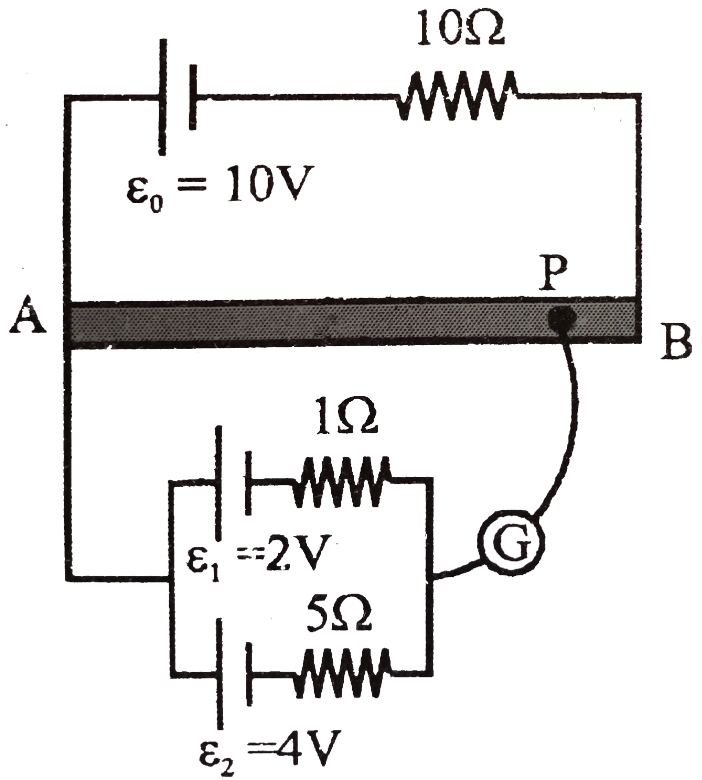
C. 0.5Ω

D. 0.75Ω

Answer: c

Watch Video Solution

74. A battery of emf $\varepsilon_0 = 10V$ is connected across a $1m$ long uniform wire having resistance $10\Omega\,/\,m.$ Two cells of emf $\varepsilon_1 = 2V$ and $\varepsilon_2 = 4V$ having internal resistance 1Ω and 5Ω respectively are connected as shown in the figure. If a galvanometer shows no deflection at the point P, find the distance of point P from the point a.



A. 0

B. $25cm$

C. $50cm$

D. $100cm$

Answer: d

Watch Video Solution

75. 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. $5:4$

B. $3:4$

C. $3:2$

D. $5:1$

Answer: c

Watch Video Solution

76. The charge flowing through a resistance R varies with time $tasQ = at - bt^2$. The total heat produced in R is

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

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

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

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

Answer: c

Watch Video Solution

77. If voltage across a bulb rated 220 volt-100 watt drops by 2.5% of its value, the percentage of the rated value by which the power would decrease is

A. $20\ \%$

B. $2.5\ \%$

C. $5\ \%$

D. $10\ \%$

Answer: d

Watch Video Solution

78. A $1^{\circ}C$ rise in temperature is observed in a conductor by passing a certain current . If the current is doubled , then the rise in temperature is approximately

A. $8^{\circ}C$

B. $12^{\circ}C$

C. $10^{\circ}C$

D. $36^{\circ}C$

Answer: d

Watch Video Solution

79. 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. $1:3:5$

B. $5:3:1$

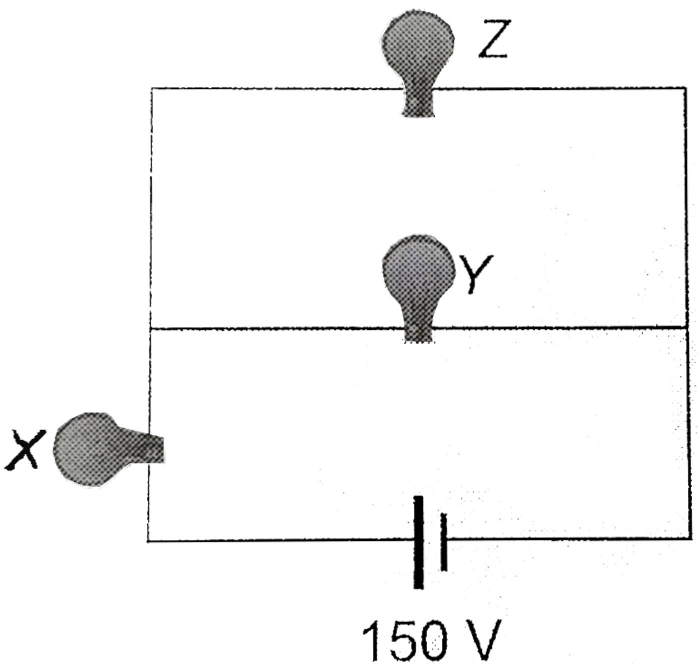
C. $1:15:125$

D. $125:15:1$

Answer: d

Watch Video Solution

80. Three $100W, 150V$ lamps are connected across a `150V power line as shown. Find (a) Voltage across each lamp and (b) total power dissipated in three bulbs.



A. Brightness of A increase but that of C decrease

B. Brightness of A increase the same but that of C decrease

C. Brightness of both A and C decrease

D. Brightness of A increase but that of C remain the same

Answer: a

Watch Video Solution

81. If two bulbs of $25W$ and $100W$ rated at $220V$ are connected in series across a $440V$ supply, will both the bulbs fuse ? If not which one ?

A. 25 W bulb

B. 100 W bulb

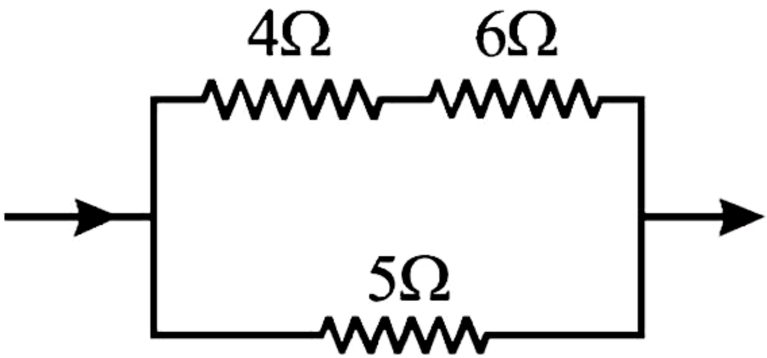
C. both of these

D. none of these

Answer: a

Watch Video Solution

82. In the circuit shown in fig the heat produced in the 5 ohm resistor due to the current flowing through it is 10 calories per second.



The heat generated in the 4 ohms resistor is

A. 1 calorie/sec

B. 2 calorie//sec

C. 3 calorie//sec

D. 4 calorie//sec

Answer: c

Watch Video Solution

83. How many lamps each of $50W$ and $100W$ can be connected in parallel across a $120V$ battery of internal resistance 10Ω so the each glows to full power ?

A. 2

B. 4

C. 6

D. 8

Answer: b

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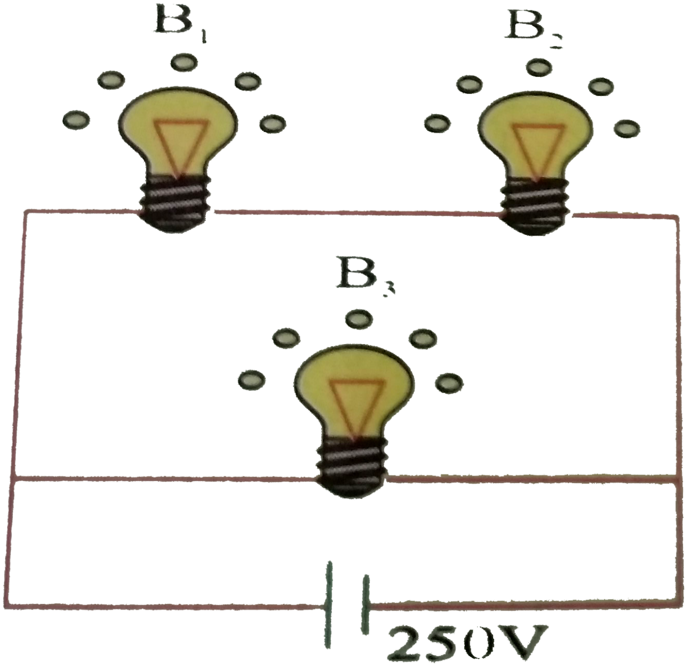
84.



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

A. $W_1 > W_2 = W_3$

B. $W_1 > W_2 > W_3$

C. $W_1 < W_2 = W_3$

D. $W_1 < W_2 < W_3$

Answer: d

Watch Video Solution

85. Incandescent bulbs are designed by keeping in mind that the resistance of their filament increases with the increase in temperature. If at room temperature, $100W$, $60W$ and $40W$ bulbs have filament resistances R_{100}, R_{60} and R_{40}, respectively, the relation between these resistances is

A. $\frac{1}{R_{100}} = \frac{1}{R_{40}} + \frac{1}{R_{60}}$

B. $R_{100} = R_{40} + R_{60}$

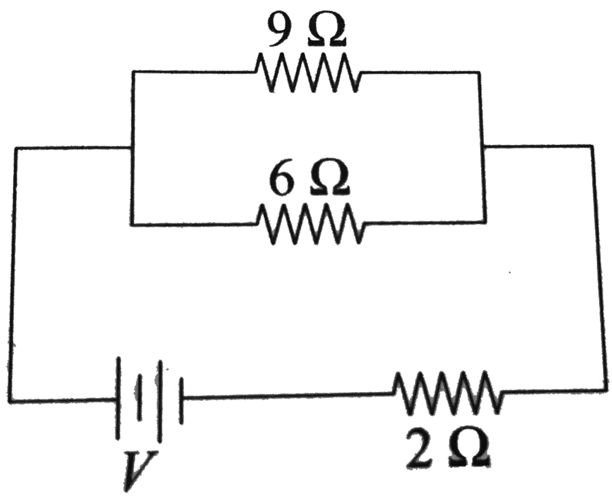
C. $R_{100} > R_{60} > R_{40}$

D. $\frac{1}{R_{100}} > \frac{1}{R_{60}} > \frac{1}{R_{40}}$

Answer: d

Watch Video Solution

86. If power dissipated in the 9Ω resistor in the resistor shown is $36W$, the potential difference across the 2Ω resistor is



A. 4 volt

B. 8 volt

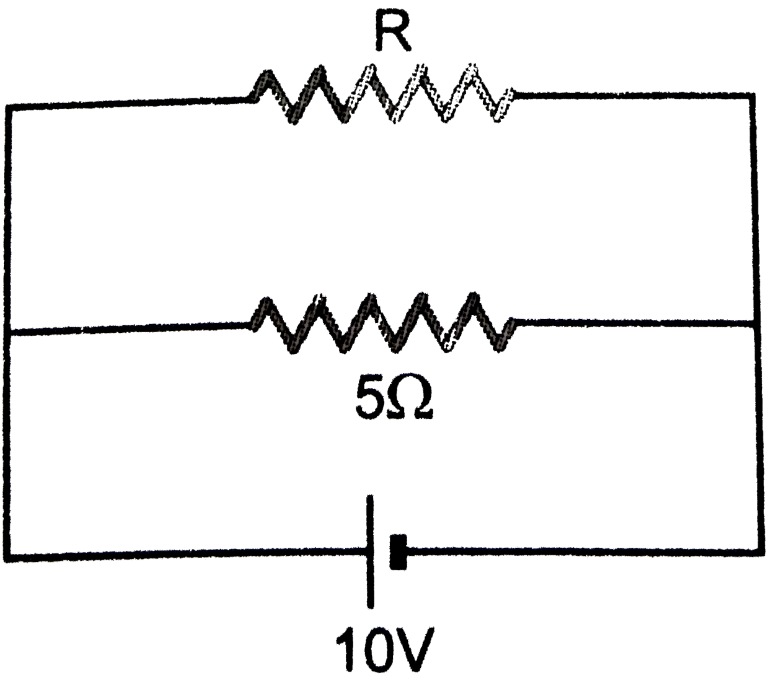
C. 10 volt

D. 2 volt

Answer: c

Watch Video Solution

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



A. 20Ω

B. 15Ω

C. 10Ω

D. 30Ω

Answer: c

Watch Video Solution

88. The supply voltage to room is 120 V. The resistance of the lead wires is 6Ω. A 60 W bulb is already switched on. What is the decrease of voltage across the bulb, when a 240 W heater is switched on in parallel to the bulb?

A. zero volt

B. 2.9 volt

C. 13.3 volt

D. 10.04 volt

Answer: d

Watch Video Solution

89. A d.c. voltage with appreciable ripple expressed as $V = V_1 + V_2 \cos \omega t$ is applied is a resistor The amount of heat generated per second is given by

A. $\dfrac{V_1^2 + V_2^2}{2R}$

B. $\dfrac{2V_1^2 + V_2^2}{2R}$

C. $\dfrac{V_1^2 + 2V_2^2}{2R}$

D. none of the above

Answer: b

Watch Video Solution

90. A heater boils $1kg$ water in time t_1 and another heater bolis the same water in time t_2. If both the heater are connected in parallel, the combination will bolt the water in time

A. $\dfrac{t_1t_2}{t_1 - t_2}$

B. $\dfrac{t_1t_2}{t_1 + t_2}$

C. $\dfrac{t_1t^2 + t_2^2}{t_1 + t_2}$

D. $\dfrac{t_1t^2 - t_2^2}{(t_1 + t_2)}$

Answer: b

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91. In the above question , if the heaters are connected in series , the combination will bolt the same water in time

A. $\frac{t_1 t_2}{t_1 - t_2}$

B. $\frac{t_1 t_2}{t_1 + t_2}$

C. $\frac{t_1 t^2 + t_2^2}{t_1 + t_2}$

D. $\frac{t_1 t^2 - t_2^2}{(t_1 - t_2)}$

Answer: d

Watch Video Solution

92. A time wire with a circuit-sectional radius of $0.02mm$ blows with a current of 5 ampere for what current another fuse wire made from the same material with cross-section radius of 0.04 mm will blow?

A. $14.7A$

B. $5A$

C. $3A$

D. $1.5A$

Answer: a

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93. A resistance of 4Ω is connected across a cell Then it is replaced by another resistance of 1Ω it is found the power dissipeted in resistance in both the is 16 walt Then

A. internal resistance of the cell is 2Ω

B. emf of the celll is $12V$

C. maximum power the can be dissipated in the external resistance is 18 walt

D. short circuit current from the cell is infinite

Answer: a,b,c

Watch Video Solution

94. The charge flowing in a conductor varies with times as $Q = at - bt^2$. Then, the current

A. decrease linealy current

B. reaches maximum and then decrease

C. falls to zero after $t = a / 2b$

D. changes at a cate of $-2b$

Answer: a,c,d

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95. Two heaters designed for the same voltage V have different power ratings. When connected individually across as source of voltage$V$, they produce H amount of heat each in time t_1 and t_2 respectively. When used together acros the same source, they produce H amount of heat in time t

A. $t = t_1 = t_2$ If the beaters are in series

B. $t = 2(t_1 + t_2)$ If the beaters are in series

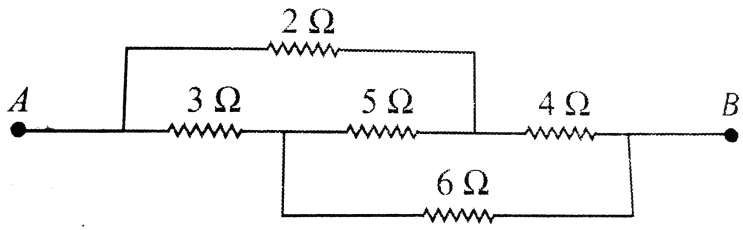
C. $t = \dfrac{t_1 t_2}{t_1 + t_2}$ If the heaters are in parallel

D. $t = \dfrac{t_1 t_2}{2(t_1 + t_2)}$ If the heaters are in parallel

Answer: a,c,d

Watch Video Solution

96. In the circuit shown in fig. some potential difference is applied between A and B. The equivalent resistance between A and B is R.



A. no current flow through 5Ω resistor

B. $R = 12.5\Omega$

C. $R = 15\Omega$

D. $R = 3.6\Omega$

Answer: a,d

Watch Video Solution

97. Two bulbs consume same energy when operated at $200V$ and $300V$, respectively . When these bulbs are connected in series across a dc source of $500V$, then

A. Ratio of potential difference across then is

$3/2$

B. Ratio of potential difference across then is

$4/9$

C. Ratio of power connected across then is

$4/9$

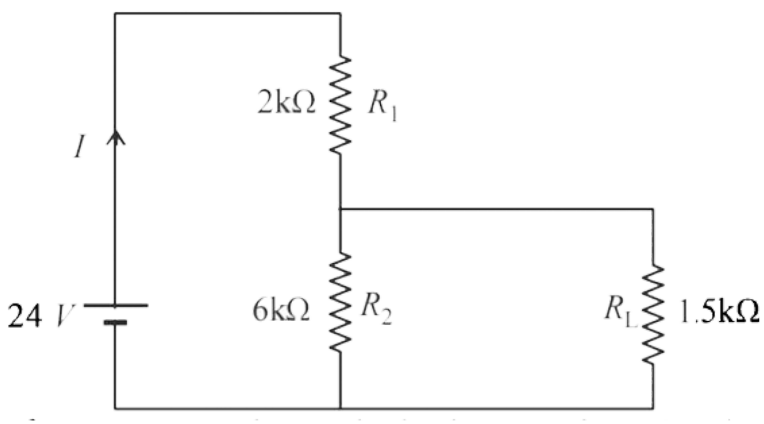
D. Ratio of power connected across then is

$2/3$

Answer: b,c

Watch Video Solution

98. For the circuit shown in figure



A. the current I through the battery is $7.5 mA$

B. the potential diifference across R_3 is 18 V

C. ratio of a power dissipated in R_1 and R_2 is

3

D. if R_1 and R_2 are interchanged, magnitude

of the power dissipated in R_3 will decrease

by a factors of 9

Answer: a,d

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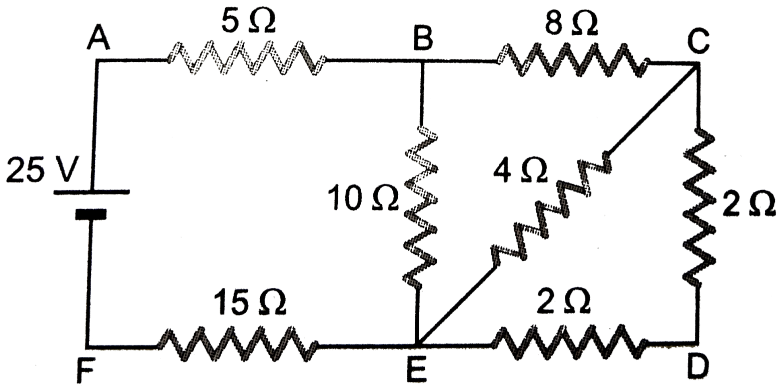
99. For the circuit



A. potential difference between points

B and E is $5V$

B. potential difference between points

B and B is $10V$

C. the current in the $4CEarm$ resistor is

$0.25A$

D. the current in the $BEarm$ resistor is $0.5A$

Answer: a,c,d

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100. Heater of an electric kettle is made of a wire of length L and diameter d. It takes 4 minutes to raise the temperature of 0.5 kg water by 40K. This heater is replaced by a new heater having two wires of the same material, each of length L and diameter 2d. The way these wires are connected is given in the options. How much time in minutes will it take to raise the temperature of the same amount of water by 40 K?

A. 4 if wires are in parallel

B. 2 if wires are in parallel

C. 1 if wires are in parallel

D. 0.5 if wires are in parallel

Answer: b,d

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101. An incandescent bulb has a thin filament of tungsten that is heated to high temperature by passing an electric current. The hot filament emits black - body radiation. The filament is observed to break up at random to break up at random locations after a sufficiently long time of operation due to non-uniform evaporation of tungsten from the fialment. If the bulb is powered at constant voltage, which of the following statement (s) is (are) true?

A. The temperature distribution over the filament is uniform

B. The resistance over small sections of the filament decrease with time

C. The filament emits more light at higher band of frequencies before at breaks up

D. The filament consumes less electrical power towards the end of the lift of the bulb 2

Answer: c,d

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102. Which of the following statements is/are correct ?

A. If n identical cells are connected in series and then battery thus formed , is short circuited by a conduction wire current through the wire will be independent of n

B. If n identical cells are connected in parallel and then battery than formed , is short circuited by a conducting wire current through the wire will be proportional of n

C. If n identical cells are connected in parallel are then battery thus formed , is short circuited by a wire having a current through the current through wire will be increase as n increases

D. none of these

Answer: a,b,c

Watch Video Solution

103. An ammeter and a voltmeter are joined in sereis to a cell. Their readings are A and V respectively. If a resistance is now joinding parallel with the voltmeter. Then

A. V will and change

B. V will increase silghtly

C. A will becomes exectly half of its initial value

D. A will becomes single more then half of its initial value

Answer: b,d

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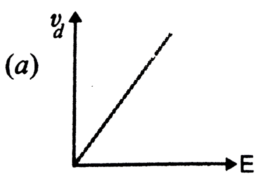
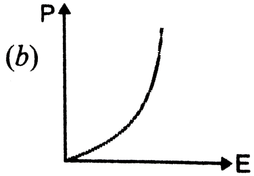
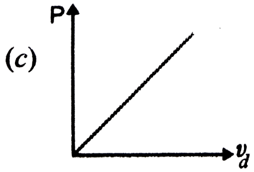
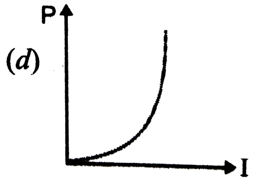
104. E denotes electric field in a uniform conductor, I corresponding current through it, v_d velocity of electrons and P denotes thermal power produced in the conductor, then which of the following graph is correct?

A. 

B. 

C. 

D. 

Answer: a,b,d

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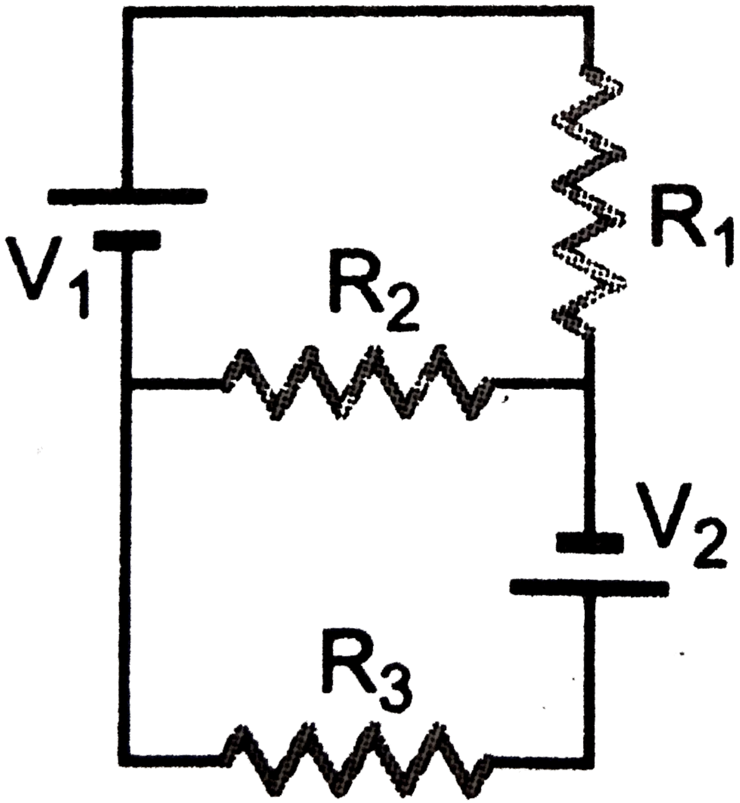
105. Two ideal batteries of $emf V_1$ and V_2 and three resistance $R_1 R_2$ and R_3 are connected

The current in resistance R_2 would be zero if



A. $V_1 = V_2$ and $R_1 = R_2 = R_3$

B. $V_1 = V_2$ and $R_1 = 2R_2 = R_3$

C. $V_1 = 2V_2$ and $2R_1 = 2R_2 = R_3$

D. $2V_1 = V_2$ and $2R_1 = R_2 = R_3$

Answer: a,b,d

Watch Video Solution

106. A uniform wire of resistance R is slaped into a regular n-sided polygon (n is seven). The equivalent resistance between any two corners can have :

A. the maximum value $R/4$

B. the maximum value R/n

C. the minimum value $R\left(\frac{n-1}{n^2}\right)$

D. the minimum value R/n

Answer: a,c,

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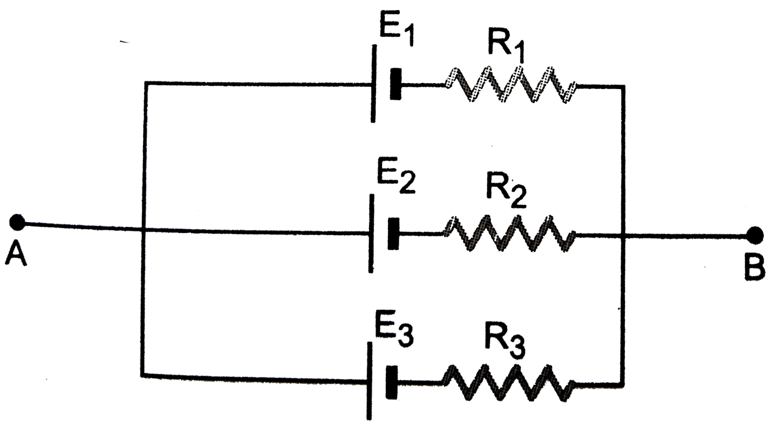
107. For the circuit



A. Equivalent internal resistance R is given by

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$$

B. Equivalent emf of the bettery in

$$E=\left(E_1+E_2+E_3\right)/3$$

C. If $E_1=\left(\frac{E_1R_1+E_2R_2}{R_1+R_2}\right)$ equivqalent

e.m.f. of the battery will be equal to E_3

D. Equivalent emf of the battery in

not only depent upon value of

E_1, E_2 and E_3 but depends upon value of

R_1, R_2 and R_3 also

Answer: a,c,d

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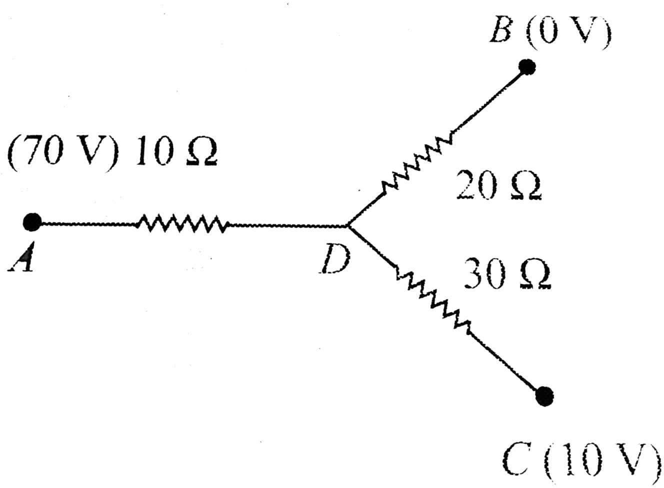
108. In the network shown in fig. , points A, B, and C are at potentials of 70 V, 0, and 10V, respectively.



A. the potential of point D is $40V$

B. The current in the sections AD, DB, DC are in the ratio $1:2:1$

C. The current in the sections AD, DB, DC are in the ratio $1:2:3$

D. the network drawn a total power of $200W$

Answer: a,b,d

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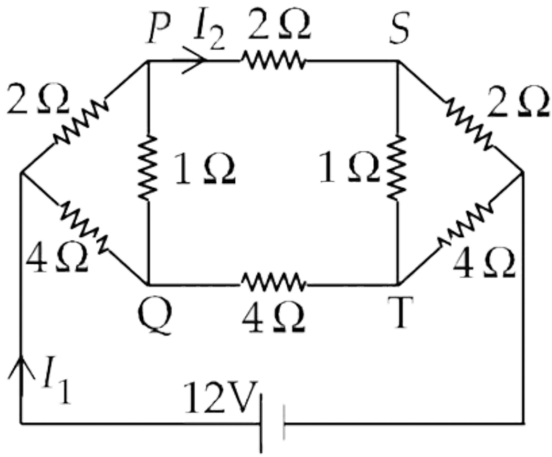
109. For the resistance network shown in the figure, choose the correct options (s)



A. The current through PQ is zero

B. $I_1 = 3A$

C. The potential, at S is less then at Q

D. $I_2 = 2A$

Answer: a,b,c,d

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110. A current passes through a wire of nonuniform cross-section. Which of the following quantites are independent of the cross section?

A. free electron density

B. current density

C. drift speed

D. the charge crossing in a given time internal

Answer: a,d

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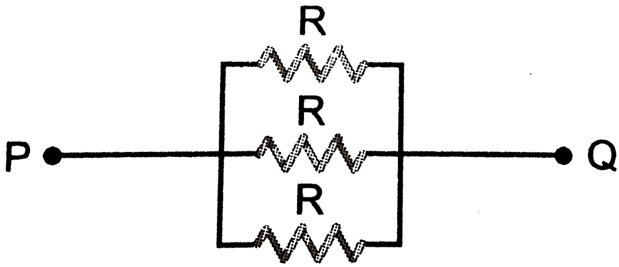
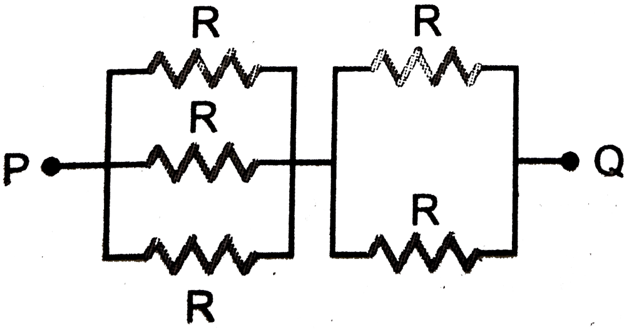
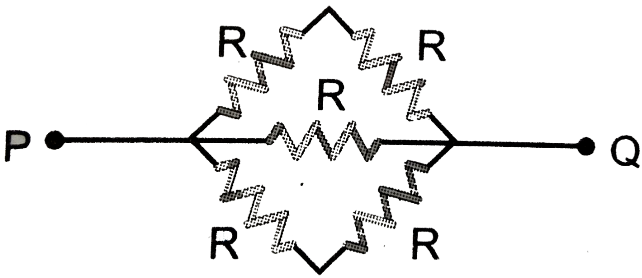
111. In the circuit elements given below, all individual resistors are identical. The resistance between P and Q in the different cases is



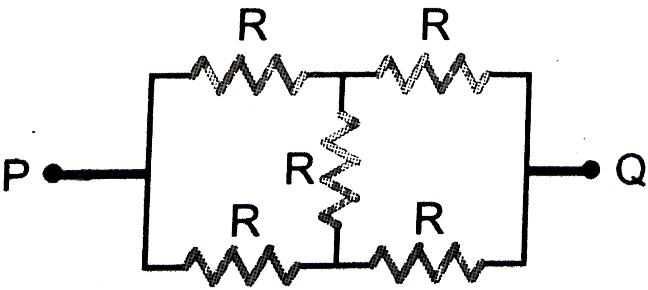
a



b



c



d

A. a) $3R$

B. b) $5R/6$

C. c) $R/2$

D. d) R

Answer: b,c,d

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112. Two resistors having equal resistances are joined in series and a current is passed through the combination. Neglect any variation in resistance as the temperature changes. In a given time interval,

A. unequal amount of thermal energy may be produced

B. equal amount of thermal energy may be produced

C. the temperature may rise equally is the resistance

D. the temperature may must equally is the resistance

Answer: b,c

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113. A wire of length $12cm$ resistance 12Ω and of uniform area of cross section is cut into twelve equal parts . Which are connecting to form a skelton cube A cell of emf $2V$ is connected across the two diagonally opposite correct of the cube Using kirchhoff's laws of junction and loop answer the following question

The current drawn from the battery is

A. $4/5\Omega$

B. $5/6\Omega$

C. $6/7\Omega$

D. $7/12\Omega$

Answer: b

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114. A wire of length $12cm$ resistance 12Ω and of uniform area of cross section is cut into twelve equal parts . Which are connecting to form a skelton cube A cell of emf $2V$ is connected across the two diagonally opposite correct of the cube Using kirchhoff's laws of junction and loop answer the following question

The current drawn from the battery is

A. $2.5A$

B. $2.4A$

C. $2.3A$

D. $3.4A$

Answer: b

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115. A wire of length $12cm$ resistance 12Ω and of uniform area of cross section is cut into twelve equal parts . Which are connecting to form a skelton cube A cell of emf $2V$ is connected across the two diagonally opposite correct of the cube Using kirchhoff's laws of junction and loop answer the following question

The current drawn from the battery is

A. 0.4 A`

B. $0.6A$

C. $1.2A$

D. $2.4A$

Answer: b

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

A. 0.4 V`

B. 0.4 V`

C. $1.2V$

D. $2.4V$

Answer: a

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

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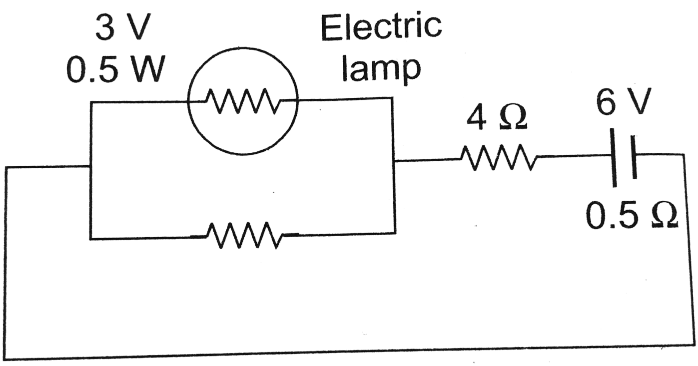
118. What should be the value of resistance R in the circuit shown in figure so that the electric bulb consumes the rated power?



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119. Find the total linear momentum of the electrons in a conductor of length $l = 1000m$ carrying a current $I = 70A$.

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120. A battery of emf E and internal resistance r is connected is to external resistance B The maximum point is the external circuit is $9W$ The current flowing in the circuit under the condition is $3A$ What is the value of E in volt ?

Watch Video Solution

121. 32 cells each of emf $3V$ are connected in series and kept in a not External the combination shown as emf $84V$ How many number of cells are connected reversely?

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122. When two identical batteries of internal resistance 1Ω each are connected in series across a resistor R, the rate of heat produced in R is J_1. When the same batteries are connected in parallel across R, the rate is J_2 = 2.25 J_2

$thenthevalueofR \in$ Omega` is

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123. Assertion: The bending of an insulated wire increase the resistance of wire

Reason : The drift velocity of electron in heat wire decreases

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: d

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124. Assertion : The e.m.f. of the drivercell in the potentiometer experiment should be greater than the e.m.f. of the cell to determined.

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: a

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125. Assertion : A domestic electrical appliance working on a three pin continue working even if the top pin is removed

Reason : The third pin is used only as safety device.

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: a

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126. Assertion : In parallel combination of electrical appliances, total power combination is equal to the sum of the powers of the individual appliances,

Reason : In parallel combination , the voltage across each appliance is the same as required for the proper working of of eletrical appliance

A. both assertion and reason are true and the reason is correct explanation of Assertion

B. both assertion and reason are true and the reason is not correct explanation of Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: a

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127. Assertion : In lower combination of electric bulbs the bulb of lower power emit more light than that of highest power bulb

Reason : The power power bulb in series gets more of higest power bulb

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: c

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128. There is a frill of 20 bulbe (connected in series) in a room. One bulb is fused. The remaining 19 bulbs are again joined in series and connected to the same supply. Will the light increase or decrease in the room ?

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: d

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129. Statement-1 : In a Meter Bridge experiment, null point for an unknown resistance is measured. Now, the unknown resistance is put inside an enclosure maintained at a higher temperature. The null point can be obtained at the same point as before by decreasing the value of the standard resistance.

Statement-2 : Resistance of metal increases with increase in temperature.

A. both assertion and reason are true and the reason is Assertion and Reason explanation of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: d

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130. Statement- 1 : When cells are connected in parallel to the external load, the effective emf increases

Statement-2 : All the cell will be sending the current to the external load in the same direction

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: d

Watch Video Solution

131. Statement- 1 : When cells are connected in series to the external load, the effective emf increase

Statement-2 : The cell help each other in sending the current to the external load

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: a

Watch Video Solution

132. Statement -1 : A potentiometer of longer length is used for accurate measurement

Statement -2 : The potential gradient for a potentiometer of longer length with a given source of e.m.f becomes small

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: a

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133. Assertion : Electric appliances with metallic body, e.g. heaters, presses etc, have three pin connections, whereas an electric bulb has a two pin connection.

Reason : Three pin connection reduce heating of connecting cables.

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: c

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134. Assertion : A laser beam $0.2W$ power can drill holes through a metal sheet, whereas $1000W$ torch-light cannot.

Reason : The frequency of laser light is much higher than that of torch light.

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: c

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135. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurment of the current and the voltage difference are 3% each, then error in the value of resistance of the wire iS

:

A. 6%

B. zero

C. 1%

D. 3%

Answer: d

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136. Six cell each of emf E and internal resistance r are connected in series. If due to over sight, two cells are connected wrongly, then the equivalent emf and internal resistance of the combination is

A. $6E, 6r$

B. $4E, 6r$

C. $2E, 6r$

D. $2E, 4r$

Answer: c

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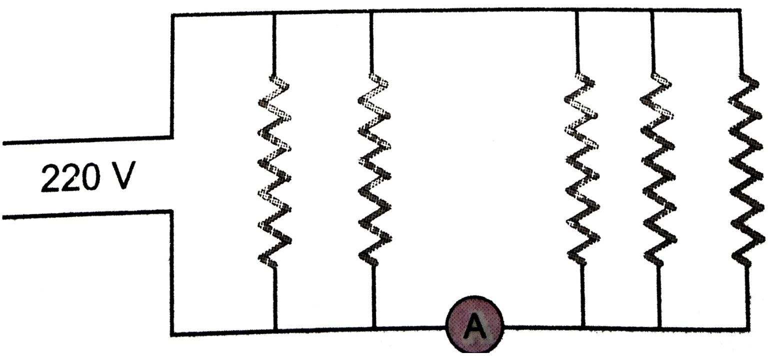
137. Five identical lamps , each of resistance 1100Ω are connected to $220V$ The reading of an ideal ammeter A is



A. $\frac{220}{1100} \times 1A$

B. $\frac{220}{1100} \times 2A$

C. $\frac{220}{1100} \times 3A$

D. $\frac{220}{1100} \times 5A$

Answer: c

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138. 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. 5

C. 6

D. 10

Answer: c

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139. In an experiment to measure the internal resistance of a cell by a potentiometer, it is found that the balance point is at a length of $2m$ when the cell is shunted by a 5Ω resistance and is at a length of $3m$ when the cell is shunted by a 10Ω resistance, the internal resistance of the cell is then

A. 1Ω

B. 1.5Ω

C. 10Ω

D. 15Ω

Answer: c

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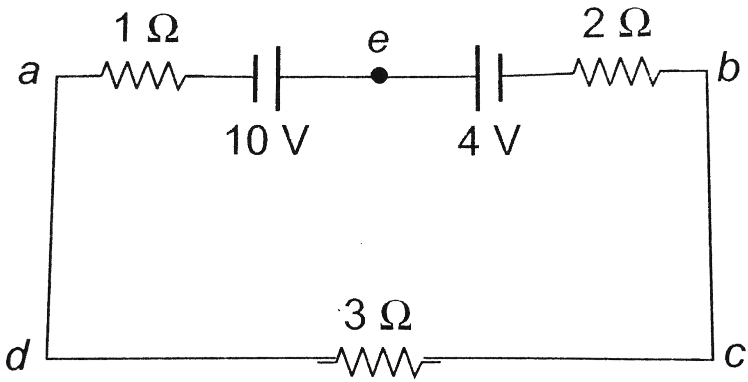
140. The magnitude and direction of the current in the circuit shown will be



A. $(7/3)$ A from A to D via F

B. $(7/3)$ A from D to A via F

C. $1.0A$ from A to D via F

D. $1.0A$ from D to A via F

Answer: c

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141. An unknown resistance R_1 is connected is series with a resistance of 10Ω. This combination is connected to one gap of a meter bridge, while other gap is connected to another resistance R_2. The balance point is at $50cm$ Now , when the 10Ω

resistance is removed, the balanced point shifts to $40cm$ Then the value of R_1 is.

A. 10Ω

B. 20Ω

C. 40Ω

D. 60Ω

Answer: b

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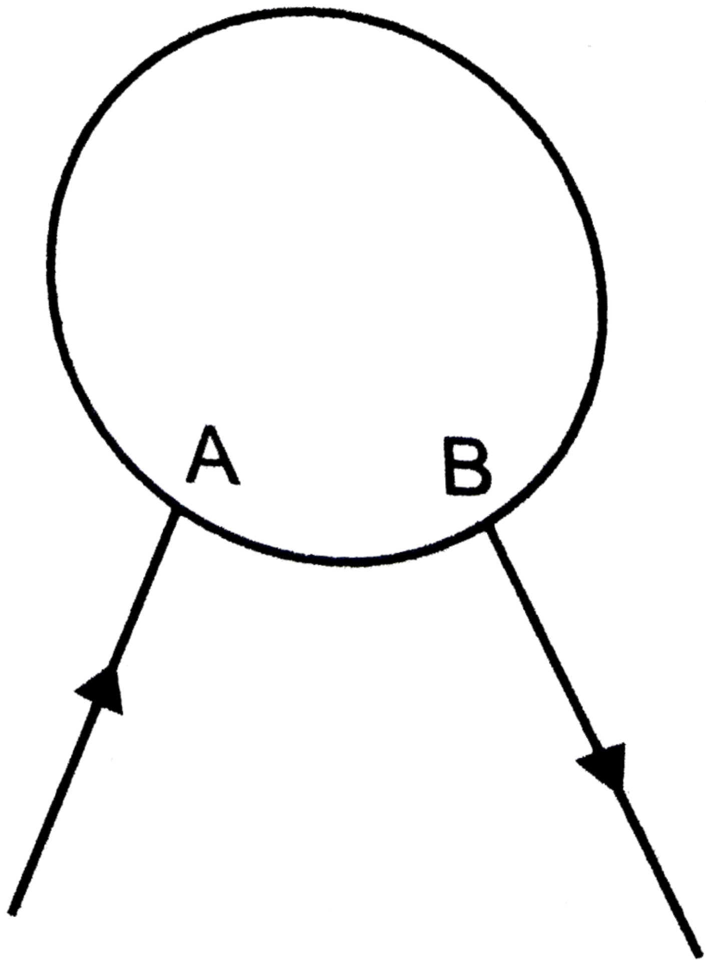
142. A uniform wire resistance 20Ω having resistance 1Ω is bent in the forms of a circuit if the equal - valent resistance between A and B is

1.8Ω then length of the shorter section is



A. $1.8m$

B. $2m$

C. $3.6m$

D. $4m$

Answer: b

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143. The drift velocity of electron in a metal conductor under effective of elecrtic field applied is

A. $10^{29} cm^{-3}$

B. $10^{29} m^{-3}$

C. $10^{23} m^{-3}$

D. $10^{26} m^{-3}$

Answer: B

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144. The drift velocity of electron in a metal conductor under effective of elecrtic field applied is

A. $10^{-1} m/s$

B. $10^{-2} m/s$

C. $10^{-3}m/s$

D. $10^{-4}m/s$

Answer: D

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145. Resistivity of the meterial in independent of

A. nature of material

B. temperature of meterial

C. dimension of meterial

D. none of the above

Answer: C

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146. The SI unit of cunductivity is

A. ohm

B. mho

C. ohm- m

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

Answer: D

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147. The resistance of the given carbon resistor is $(24 \times 10^{6} \pm 5\,\%)\,\Omega$. What is the sequence of colours on the strips provided on resistor?

A. red, yellow and gold

B. red, yellow , blue and gold

C. brown , orange , green and gold

D. red,green , yellow and gold

Answer: A

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148. The electric field in the copper wire of area of cross - section $2mm^2$ carrying a current of $1A$ is (use resistivily of copper is $1.7 \times 10^{-8} \Omega m$)

A. $8.0 \times 10^{-2} Vm^{-1}$

B. $8.5 \times 10^{-2} V/m$

C. $8.0 \times 10^{-3} V/m$

D. $8.0 \times 10^{-4} V/m$

Answer: C

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149. A wire of resistance 5Ω is drawn out so that its length is increased by twice its original length. Calculate its new resistance.

A. 10Ω

B. 20Ω

C. 15Ω

D. 45Ω

Answer: B

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150. Two wire of copper have length L and $2L$ and cross section $2A$ and A respectively .The ratio of their specific resistance would be would be

A. $1:2$

B. $8:1$

C. $1:8$

D. $1:1$

Answer: D

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151. Define resistivity of the material. State its SI unit and discuss its variation with temperature in case of (i) metals (ii) semiconductors and (iii) insulators.

A. increased

B. decreases

C. becomes zero

D. remains constant

Answer: A

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152. The Total resistance when connected in series in 9Ω and when connected in parallel is 2Ω The value of two resistance are

A. 4Ω and 5Ω

B. 2Ω and 7Ω

C. 3Ω and 6Ω

D. 1Ω and 8Ω

Answer: C

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153. An total resistance R is connected to a cell of internal resistance r the maximum current flows in the external resistance, when

A. $R = r$

B. $R < r$

C. $R > r$

D. none of the above

Answer: A

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154. When in electric field is applied to a metallic conductor at room temperature the thermal speed of electrons is..........and drift velocity of electrons is ....

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155. Current is a.......quantity and in SI unit is........

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156. In a closed loop when current has not been reached the stedy start , the current through different cross-section of the irregular shaped conductor of a particular instant would have......... values.

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157. The direction of current density is .... To the direction of friff velocity of electrons in the conductor

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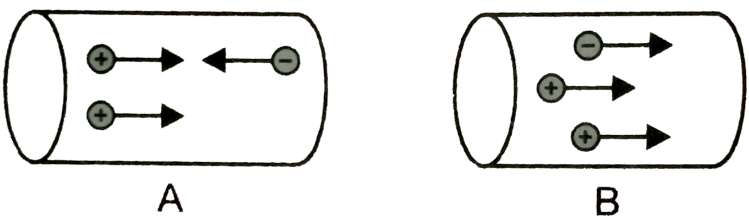
158. Consider positive and negative charge (all of equal magnitude) moving horizontally through two conductor A and B The magnitude of current is ....in A and .... In B



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159. The mean time internal of two consecutive collisiion of the electron with positive ion in a conductor is called ....

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160. As the temperature of a metal conductors increase the frequency of collision of electrons .... and time of relation of the electrons......

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161. Resistivity is the property of the .... and it depends opon the ..... of unbalance and .....

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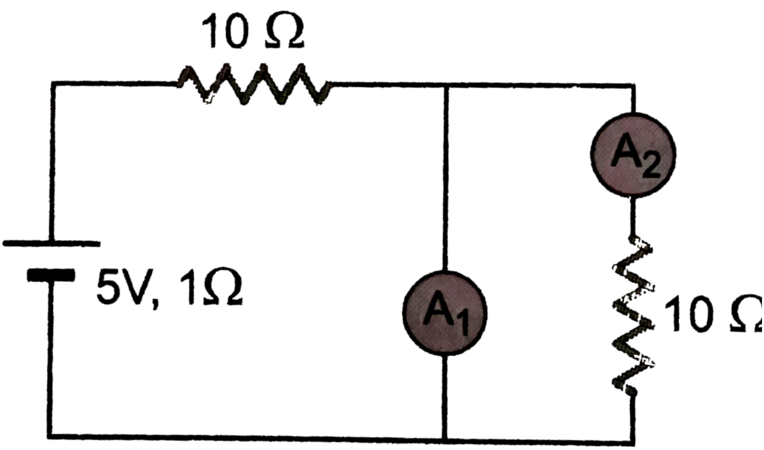
162. In the circuit all the measuring instruments are ideal the reading of ammeter A_2 is ....



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163. The medium between the plate of battery offers some resistance to the flow of charge within th e battery this given rise to ...... of the cell

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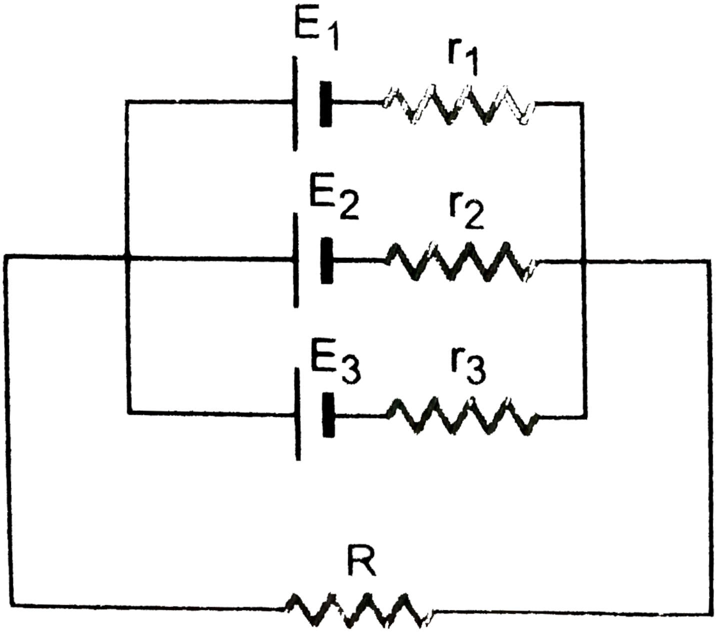
164. If three cell are connected in parallel then equivalent emf....... and equivalent internal resistance is .....



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165. Kirchhoff's second law is based on law of conservation of

A. sum of mass and energy

B. momentum

C. energy

D. charge

Answer: c

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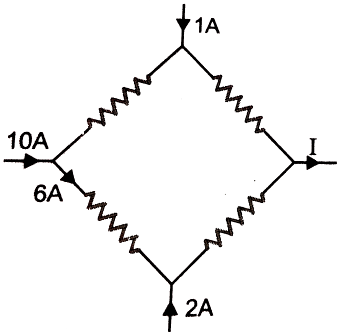
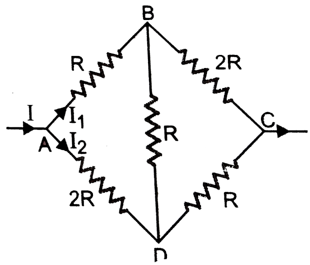
166. The value of current I, in the will be





A. $9A$

B. $12A$

C. $13A$

D. $19A$

Answer: c

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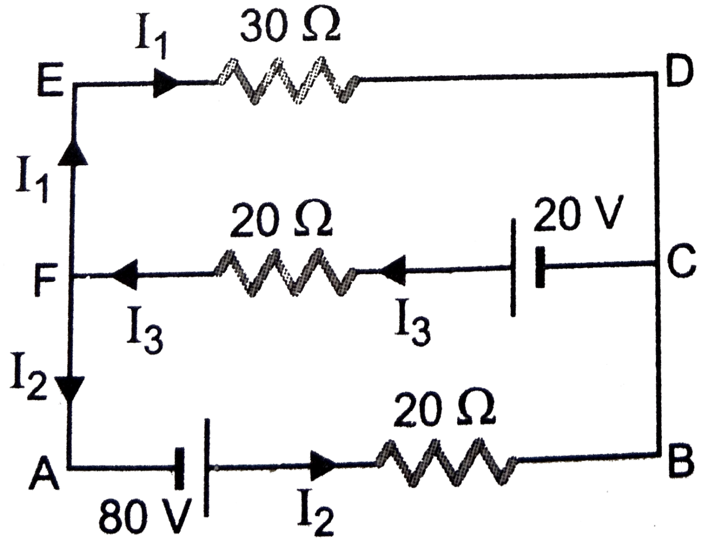
167. Use kirchhoff's rules to determine the value

of current I_1 flowing in the circuit



A. $1/5$

B. $21/5$

C. $31/5$

D. $41/5$

Answer: c

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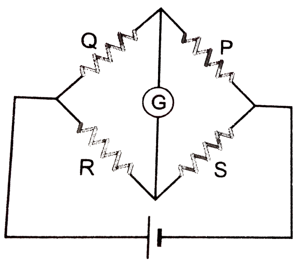
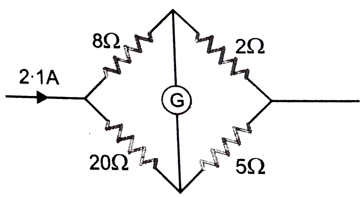
168. In a Wheatstone bridge resistance connected the bridge is balanced , when the resistance are in the ratio





A. $\frac{P}{Q}=\frac{R}{S}$

B. $\frac{Q}{P} = \frac{S}{R}$

C. $PQ = RS$

D. $\frac{P}{Q} = \frac{S}{R}$

Answer: d

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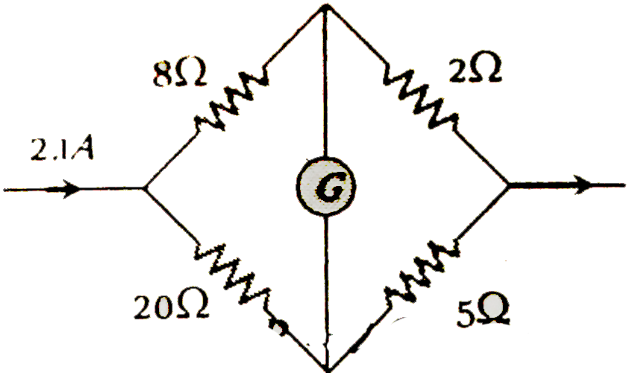
169. In the given figure, when galvanometer shows no deflection, the current (in ampere) flowing through 5Ω resistance will be



A. $0.5A$

B. $0.6A$

C. $0.9A$

D. $1.5A$

Answer: b

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170. In a meter bridge experiment the ratio of left gap resistance to right gap resistance is $2:3$ the balance point from is

A. $20cm$

B. $40cm$

C. $50cm$

D. $60cm$

Answer: b

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171. Metal wire is connected in the left gap, semi conductor is connected in the right gap of meter bridge and balancing point is found. Both are heated so that change of resistances in them are same. Then the balancing point

A. will shift toward right

B. will shift toward left

C. will be shift

D. depends on rise of temperature

Answer: a

172. In the measurement of resistance by a meter-bridge, the current is necessarily reversed through the bridge wire to eliminate

A. end error

B. index error

C. error due to electric effect

D. random error

Answer: c

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

A. Wheatstone bridge

B. ammeter

C. a potentiometer

D. voltmeter

Answer: c

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174. Which of the following statement is only currect statement for a potentiometer?

A. it cannot measure potential difference

B. it cannot measure the capacitance of a capacitor

C. it cannot measure current

D. it cannot measure resistance

Answer: b

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175. Kirchhoff's first rule is based on ....

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176. Kirchhoff's second law is based on law of conservation of

Watch Video Solution

177. A meter-bridge is based on the principle of

Watch Video Solution

178. A meter bridge cannot be used to measure ...... resistances

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179. The fall of potential per unit length of wire is called........

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180. A balance point is obtained in the potentiometer wire .If the fall of potential along the potentiometer wire Due to......is greater than the .....in the balanced

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181. Explain, why should the current be not passed through potentiometer wire for long time ?

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182. Can you interchange the positions of the battery in the auxiliary circuit and cell whose emf is to be determined in potentiometer circuit diagram?

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183. Potentiometer in so named becomes it measures........

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184. The expression for potential gradent of potentiometer wire in terms of specific resistance p of the wire area of its cross -section A and current I flowing wire is........

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185. Read the following statements carefully : (i) produced of a volt and an ampere is a joude/second (ii) The produced of a volt and watt is horse power (iii) The produced of a volt and a coulomns is joule (iv) Walt-hour can be measured in terms of electron-volt

A. All are correct

B. (i), (iii) and (iv) are correct

C. (ii) and (iii) are correct

D. (ii)and (iv) are correct

Answer: b

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186. A constant voltage is applied between the two ends of a uniform metallic wire. Some heat is developed in it. The heat developed is doubled if

A. Both the length and radius of the wire are halved

B. Both the length and radius of the wire are doubled

C. the radius of the wire is doubled

D. the length of the wire are doubled

Answer: b

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187. How much electrical energy in kilowatt hour is connected to operating ten 5 watt bulbs for 10 hour per day in a mouth (30 days)

A. 1500

B. 15000

C. 15

D. 150

Answer: c

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188. Two electric bulbs of 40 watt each are connected in series. The power consumed by the combination will be

A. 20 watt

B. 60 watt

C. 80 watt

D. 100 watt

Answer: a

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189. How many calories of heat will be approximately developed in a $210W$ electric bulb in 5 min ?

A. 1050

B. 6300

C. 15000

D. 80000

Answer: c

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190. Two conducting wires of the same material and of equal length and equal diameters are first connected in series and then in parallel in an electric circuit. The ratio of the heat produced in series and parallel combinations would be :

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: d

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191. A $100W, 200V$ bulb is operated on a $110V$ line. The power consumed is

A. $50W$

B. $75W$

C. $90W$

D. $25W$

Answer: d

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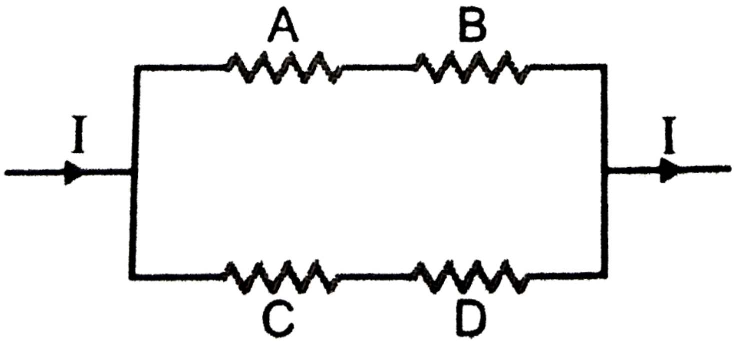
192. Four resistance $A = 20\Omega, B = 30\Omega, C = 40\Omega, D = 60\Omega$ are connected arrange the heats produced per second in them in decreasing order



A. A, B, C, D

B. D, C, B, A

C. B, A, D, C

D. B, A, C, D

Answer: c

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193. A $1^\circ C$ rise in temperature is observed in a conductor by passing a certain current . If the current is doubled , then the rise in temperature is approximately

A. $10^\circ C$

B. $12^\circ C$

C. $16^\circ C$

D. $20^{\circ} C$

Answer: d

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194. A wire when connected to $220V$ mains sapply power dissipation P_1 Now the wire is cut into two equal pieces which are connected in parallel to the same apply 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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195. An electric cell is .... a source of charges..... of energy it is an energy......

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196. The rate at which electric work in done by the source of emf in maintaining the current is called......

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197. When an electric current in passed a conductor a becomes hot sometimes .This effect is knoen as .....of current

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198. For a given voltage and time ,the heat produced in a conductor is .... To the resistance of the conductor

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199. The unit of electricity is ......

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200. $10kWh = \dots\dots\dots J$

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201. The resistance of high electric instrument is .... than that of low electric power

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202. The ratio of output power to input power of an elecrtic device is called.......

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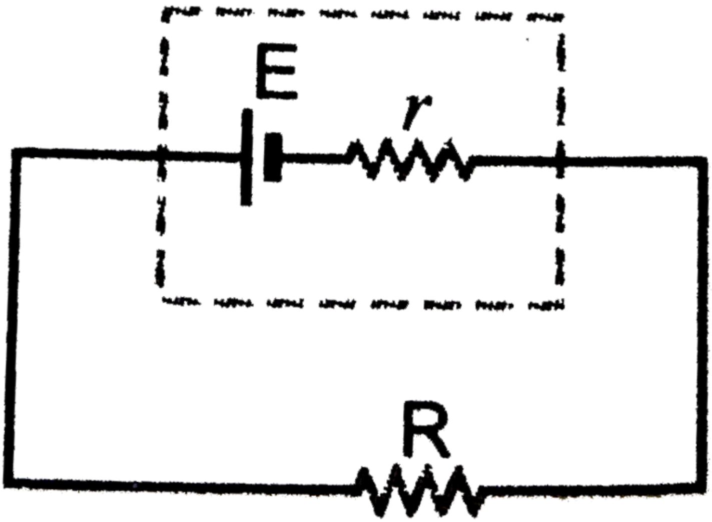
203. If a load resistance r then power supplied by the cell to load R is maximum if ..... And maximum power is given by .....



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204. If a battery of emf E, internal resistance r is being charged by a current $I$from a charge then the rate at which energy is supplied by charger is .... And the rate at which chemical energy is stored in the battery is ......

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205. If 2×10^{20} electrons pass through a loop in one minute, What is the current in milliampere ?

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206. In Bohr model of hydrogen atom , the electron revolves around the nucleus in a circular orbit of radius $5.1 \times 10^{-11} m$ at a frequency of 6.8×10^{15} revolutions per second. Find the equivalent current at may point on the orbit of the electron

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207. A solution of sodium chloride discharge $6.0 \times 10^{16} Na^{+}$ and $4.5 \times 10^{16} Cl^{-1}$ Ions in 2 seconds. What is the current passing through the solution ?

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208. In hydrogen atoms, the electron moves in an orbit of radius $5.0 \times 10^{-11} m$ with a speed of $2.2 \times 10^{6} ms^{-1}$. Find the equivalent curren , Electronic change $= 16 \times 10^{-19} C$

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209. If 0.6 mole of electrons through a wire in 50 minutes What is (a) the total charge the passes drough the wire and (b) the magnitude of the current ? Avarege a number $= 6 \times 10^{23}$ per mol

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210. The charge flowing through a conductor varies with time as

$q = 8t - 3t^2 + 5t^3$

Find (i) the initial current (ii) time after which the current reaches a maximum value of current

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211. The charge flowing in a conductor varies with time so $q = 2t - 6t^2 + 10t^3$

where $q$is in coloumn and r in second Find (i) the initial current (ii) the time after which the value of current reaches is maximum value (ii) the maximum or minimum value of current

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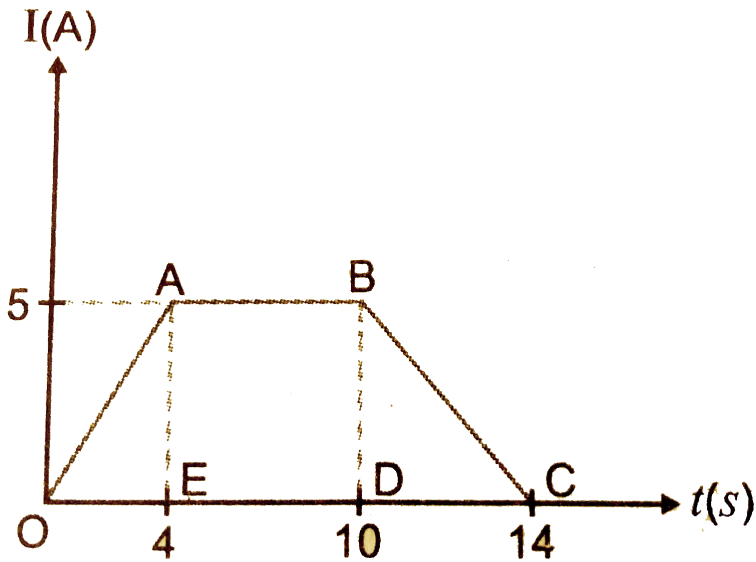
212. Shows on a plot of current I through the cross section of the wire over a time intenal of $14s$ Find the amount of charge that passes through the wire (i) during $10s$ (ii) during $14s$



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213. An electric current of $20\mu A$ appears in a discharege tube if the discharge current is due to flow of equal number of electrons and protons then how many electrons flow across a cross-section of the tube in 2 minutes

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214. A conductor of length L is connected to a dc source of emf ε. If this conductor is replaced by another conductor of same material and same area of cross-section but of length 3L, how will the drift velocity change?

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215. A copper wire has a resistance of 10Ω and an area of cross-section $1mm^2$. A potential difference of $10V$ exists across the wire .Calculate the drift speed of the electrons if the number of electrons per cubic metre in copper is 8×10^{21} electrons.

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216. The number of free electrons per 100 mm of ordinary copper wire is 2×10^{21}. The average drift speed of electorn is $0.25mm/s$. What is the current flowing?

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217. Estimate the average drift velocity of conduction electrons in a copper wire of cross-sectional area $2.5 \times 10^{-7} m^2$, carrying a current of 2.7 A. Assume the density of conduction electrons to be $9 \times 10^{28} m^{-3}$.

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218. A copper wire of diameter 1.0 mm carries a current of 0.2 A. Copper has 8.4×10^{28} atoms per cubic metre. Find the drift velocity of electrons, assuming that one charge carrier of 1.6×10^{-19} C is associated with each atom of the copper.

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219. What is the drift velocity of electrons in a silver wire of length $1m$ having cross-section area

$3.14 \times 10^{-6} m^2$ and carriying a current of $10A$. Given atoms weight of weight of silver $= 108$ density of silver $10.5 \times 10^3 kg/m^3$, charge of electron $1.6 \times 10^{-19} C$, Avogadro's number 6.023×10^{26} per kg.atom

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220. Protons in cosmic-rays strike the earth's over the earth's surface of 10 protons $m^{-2} s^{-1}$. What dioes the total current the earth receive from beyond its atmosphere in the form of incident consmic ray proton ? The earth's radius is $6.4 \times 10^6 m$

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221. A uniform copper wire of length $1m$ and cross section area $5 \times 10^{-7} m^2$ carries a current of $1A$. Assuming that are 8×10^{28} free electron per m^3 in copper, how long will an electron take to drift from one end of the wire an electron the other. Charge on an electron $= 1.6 \times 10^{-19} C$

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222. Find the current flowing through a copper wire of length 0.2m, area of cross-section $1mm^2$, when connected to a battery of 4 V. Given that electron mobility $= 4.5 \times 10^{-6} m^2 V^{-1} s^{-1}$ and charge on electron $= 1.6 \times 10^{-19} C$. The number density of electron in copper is $8.5 \times 10^{28} m^{-3}$.

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223. A current of 3 A is flowing through a wire of length 2 m and cross- sectional area $1mm^2$. If wire contains 10^{29}electrons $/ m^3$, calculate the average time taken by an electron to cross the length of the wire.

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224. A current of $4.4A$ is flowing in a copper wire of radius $1mm$ density of copper is $9 \times 10^3 kgm^{-3}$and its atoms is $63.5u$ If every atoms of copper contributes one condition electron , then th drift velocity of electrons is nearly [density of copper $9 \times 10^3 kgm^3$]

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225. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm diameter and having a resistance of 2.0Ω.

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226. An electric lamp which runs at 80 volt d.c. and consumes 10 ampere is connected to 100 volt, 50 Hz a.c. mains. Calculate the inductance of the choke required.

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227. A wire $50cm$ long and $0.12mm$ diameter has a resistance of 4.0Ω find the resistance of another wire of the same material whose length is $1.5m$ and diameter is $0.15mm$

Watch Video Solution

228. A uniform wire of length 1 and radius r has resistance 100Ω. it is recast into a thin wire of (i) length $2l$ (ii) radius $r/2$. Calculate the resistance of new wire in each case.

229. There are two wires of copper and iron of the same length but difference radii .When equal potential difference between the ends of each wire, the same current flows in them. What the ratio of their radii .Specific resistance of copper and irons are $1.6 \times 10^{-8} \Omega m$ and $1.0 \times 10^{-7} \Omega m$ respectively

230. A wire of mass $10g$ radius $1mm$ is compressed to its length by 10% Calculate percentage change in its resistance.

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231. A wire stretched to increase its length by5%. Calculate percentage charge in its resistance.

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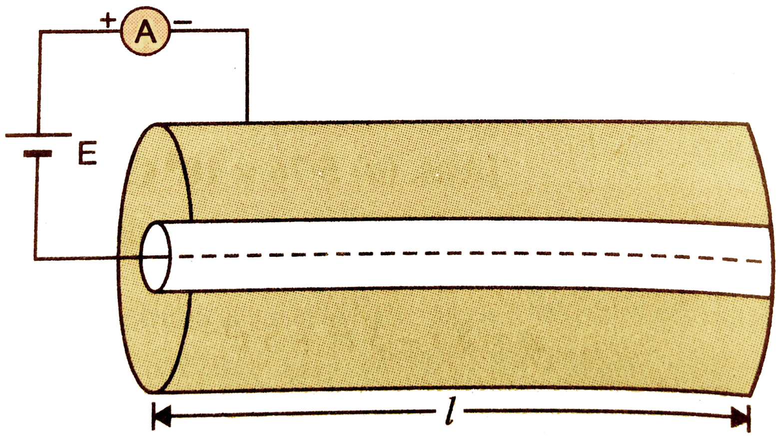
232. A hollow cylinder of length l and of radii a and b is filled with a material of resistivity ρ and is connected to a battery of emf E through an ammeter. Find the current through ammeter



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233. A theostat has 1000 turn a wire radius $0.4mm$ having resistivity $49 \times 10^{-8} \Omega m.$ The diameter of each turn is `4 cm. What are the maximum value of conductance and conductivity of rheostat wire.

Watch Video Solution

234. Calculate the mass of copper required to draw a wire $5km$ long having resistance of 5Ω .The density of copper is $8.9 \times 10^{3} kgm^{-3}$ and resistance of copper is $1.7 \times 10^{-8} \Omega m$

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235. Two wires A and B of the same material have their lengths in the ratio $5:3$ and diameter in the radius $2:3$. If the resistance of wire A is 15Ω. find the resistance of wire B

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236. A wire of 15Ω resistance is gradually stretched to double in original length. it is then cut into two equal parts .These parts are then connected in parallel across a 3.0 volt battery.

Find the current draw from the battery .

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237. Find the time of relation between collision and free path of electrons in copper at room temperature .Given resistance of copper $= 1.5 \times 10^{-8} \Omega m$ number density of electron in copper $= 8.5 \times 10^{28} m^{-3}$

charge on electron $= 1.6 \times 10^{19} C$,

mass of electrons $= 9.1 \times 10^{-19} kg$

Drift velocity of free electron

$= 1.6 \times 10^{-4} ms^{-1}$

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238. Calculate the conductance and conductivity of a wire of radius 0.01Ω area of cross -section $10^{-4} m^2$ length $0.1m$

Watch Video Solution

239. A theostat has 1000 turn a wire radius $0.4mm$ having resistivity $49 \times 10^{-8} \Omega m$. The diameter of each turn is `4 cm. What are the maximum value of conductance and conductivity of rheostat wire.

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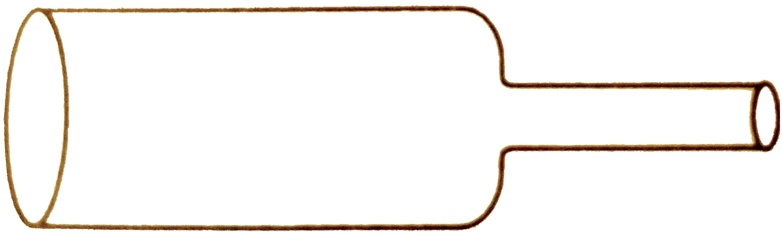
240. Currrent flows through a constriction conductor. The diameter and current density in the left of connection are $2.0mm$ and $1.3 \times 10^6 Am^{-2}$ (i) How much current flow through the constriction ? (ii) If the current density is tripled as it emerges from the right side of the constriction, what is the diameter of the hand is the diameter. of the right hand side of constriction?



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241. A copper wire of diameter $0.16cm$ connected in series to an aluminum wire of diameter $0.25cm$. A current of 10 ampere is diameter through them Find (a) current density in copper wire (b) drift velocity of electron in the aluminium wire

.The number of free electrons per unit volume of aluminium wire is $10^{29} m^{-3}$

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242. A wire carries a current of 0.5A, when a potential differnece of 1.5 V is applied across it. What is its conductance ? If the wire is of length 3 m and area of cross-section $5.4 mm^2$, calculate its conductivity.

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243. Calculate the radius of the wire of conductance $10\Omega^{-1}$ and length $10cm$ whose electrical conductivity is $10^3 Sm^{-1}$

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244. If the resistance of a conductor is 5Ω at $50^\circ C$ and 7Ω at $100^\circ C$ then the mean temperature coefficient of resistance of the material is

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245. Resistance of tungsten wire at $150^{\circ} C$ is 133Ω. Its resistance temperature coefficient is $0.0045 / ^{\circ} C$. The resistance of this wire at $500^{\circ} C$ will be

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246. The temperature coefficient of resistance of a wire is 0.00125 per $.^{o} C$. At 300K, its resistance is 1 Ω. The resistance of the wire will be 2 Ω at

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247. A copper coil has resistance of 20.0Ω at $0^{\circ}C$ and a resistance of 26.4Ω at $80^{\circ}C$. Find the temperature coefficient of resistance of copper.

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248. (a) At what temperature would the resistance of a copper conductor be double of its value of $0^{\circ}C$? (b) Does this same temperature hold for all copper conductors, regardless of shape and size? $\left[\alpha_c = 4.0 \times 10^{-3}.^{\circ}C^{-1}\right]$

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249. The temperature coefficient of resistance for two material A and B are $0.0031^{\circ}C$ and $0.0068^{\circ}C^{-1}$ respectively .Two resistance R_1 and R_2 made from material A and B respectively . Have resistance of 200Ω and 100Ω at $0^{\circ}C$. Show as a diagram the colour cube of a carbon resistance that would have a resistance equal to the series combination of r_1 and R_2 at a temperature of $100^{\circ}C$ (Neglect the ring corresponding to the tolerance of the carbon resistor)

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250. A carbon resistance of $4.7k\Omega$ is to be market with strips or hands of different colours for its identification. Write the sequence of colours

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251. A voltage of $30V$ is applied across a carbon resistance with first, second and third strips or bonds. Find the value of current through the resistance.

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252. A current of 5mA is passed through a colour coded carbon resistor with first, second and third rings of black, brown and red. What is the voltage drop across the resistor ?

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253. What is the colour of the third band of a coded resistor of resistance 0.34Ω ?

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254. A wire of uniform cross-section and length l has a resistance of 16Ω is cut into four equal parts. Each part is stretched uniform to length l and all the four stretched parts are connected in parallel calcuate the total resistance of the combination so formed. Assume that stretching of wire does not cause any change in the density of its material

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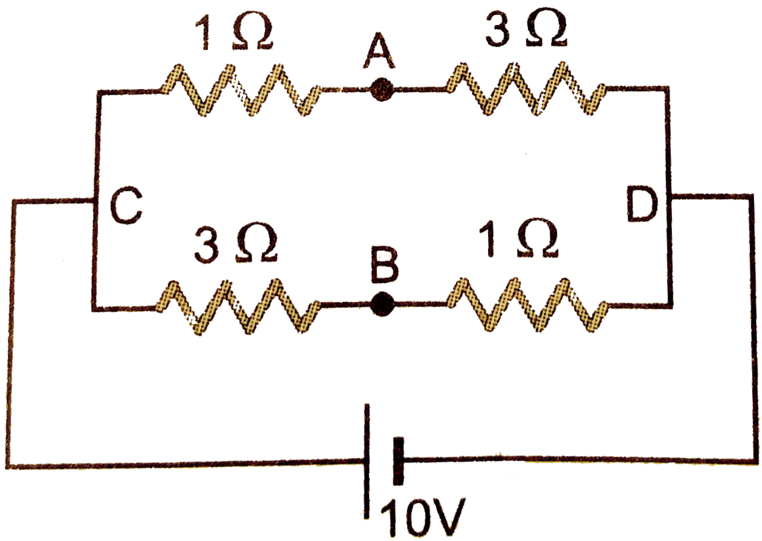
255. A battery of emf $10V$ is connected as. Find the potential difference between the point A and B



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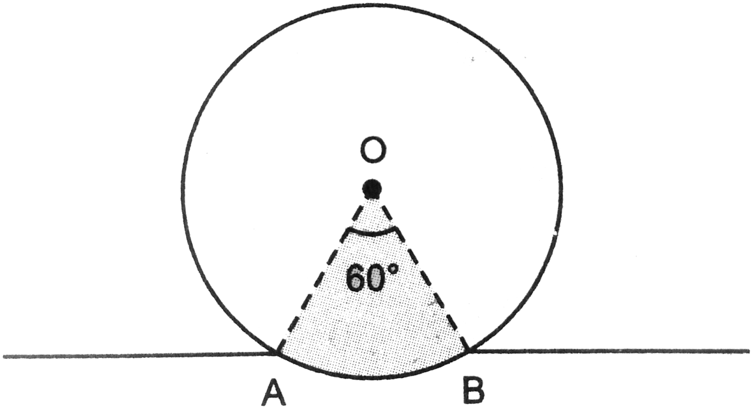
256. A resistor of 24Ω resistance is bent in the form of a circle as



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What is the effective resistance between points A and B?

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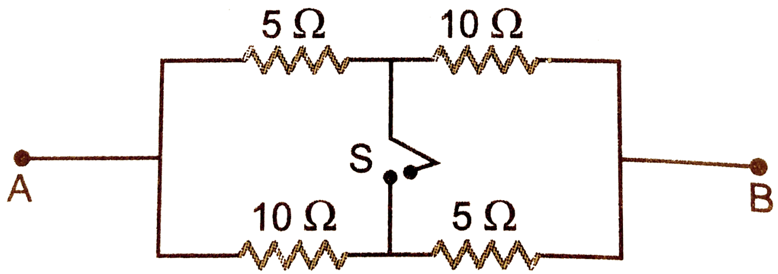
257. Find the effective the resistance of the network between the point A and B when (i) the switch is open (ii) the swich in closed



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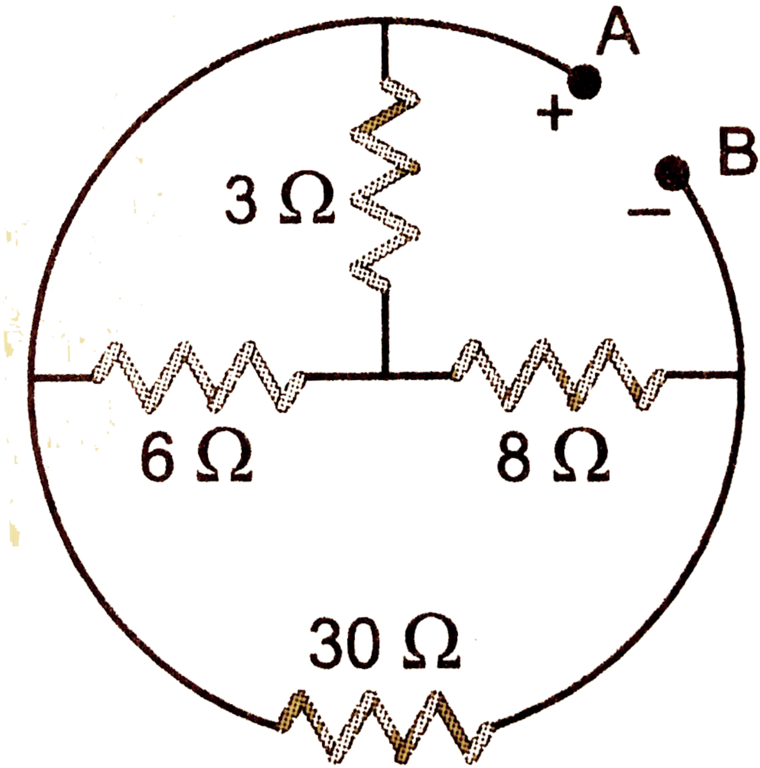
258. Find the equivalent resistance between point A and B



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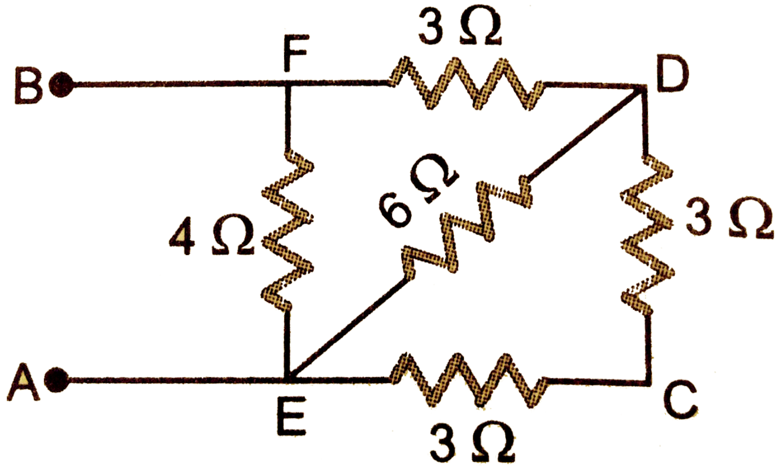
259. Find the net resistance between point A and B in the circuit



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260. A parallel combination of three resistors take a currect of $7.5A$ from $30V$ supply. If the two resistor are 10Ω and 12Ω. find the third one.

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261. A wire of resistance 2.20Ω has a length $2m$. Calculate the length of the similar wire which connected in parallel with $2m$ length wire will give a resistance of 2.0Ω

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262. Two wires X,Y have the same resistivity, but their cross-sectional areas are in the ratio $2:3$ and lengths in the ratio $1:2$. They are first connected in series and then in parallel to a.d.c.

source. Find out the ratio of drift speeds of the electrons in the two wires for the two cases.

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263. When a current of $0.5A$ is passed through two resistance in series, the potential difference between the ends of the series arrangement is $12.5V$ .On connecting them in parallel and passing the current of $1.5A$, the potential difference between their ends is 6 V, calculate the two resistances.

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264. A uniform wire of resistance 4Ω is bent into circle of radius r. As specimen of the same wire is connected along the dimeter of the circle. What is the equivalent resistance across the ends of this wire?

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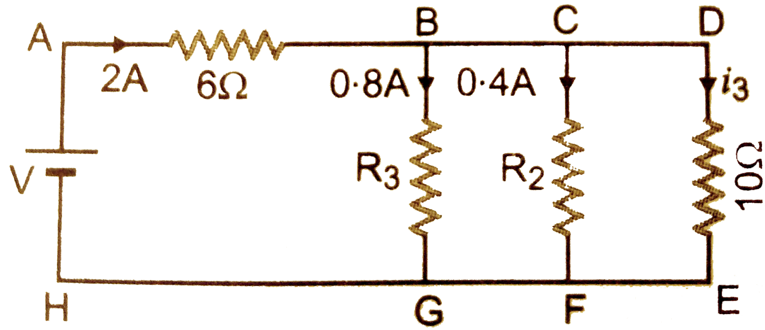
265. What is the equivalent resistance between A and H of resistances



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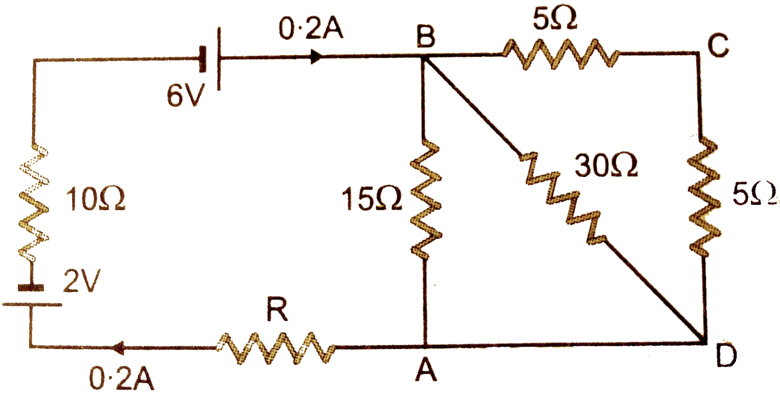
266. Calculate the value of the resistance R in the circuit in the so that the current in the circuit is $0.2A$. What would be the potential difference between points A and B ?



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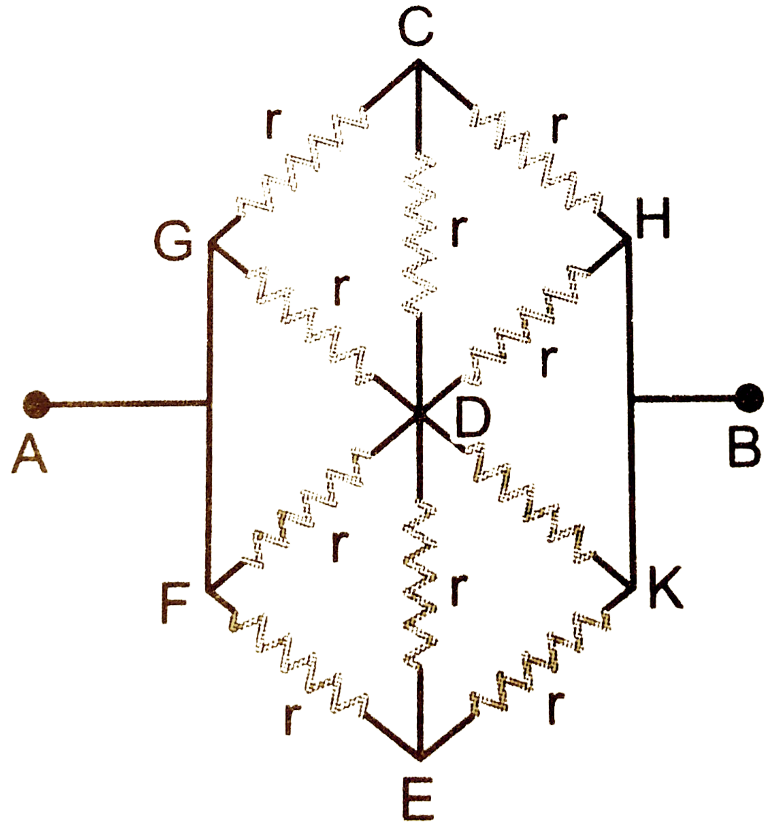
267. Find the effective resistance between point A and B of a hexagonal circuit



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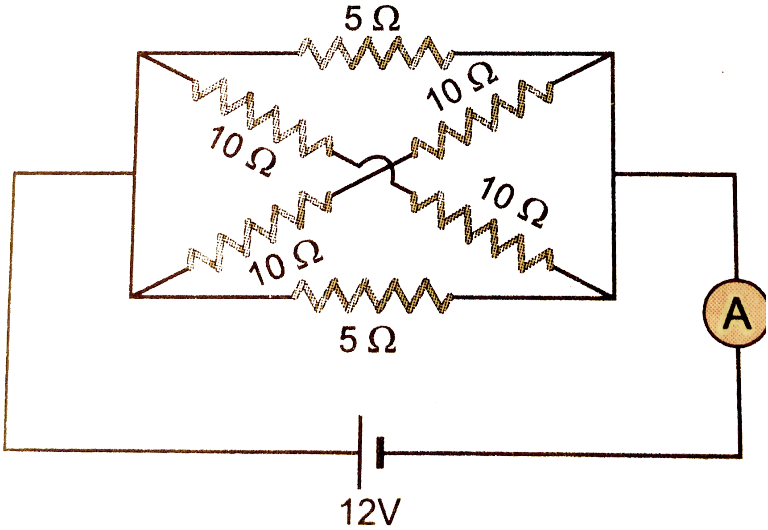
268. Calculate the current show by the ammeter

A in the circuit diagram



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269. You are given n resistors each of resistance r .These are first connected to get minimum resistance .In the secoind case these are again connected differently to get maximum possible resistance. Compute the ratio between the minimum and maximum value of resistance so obtained.

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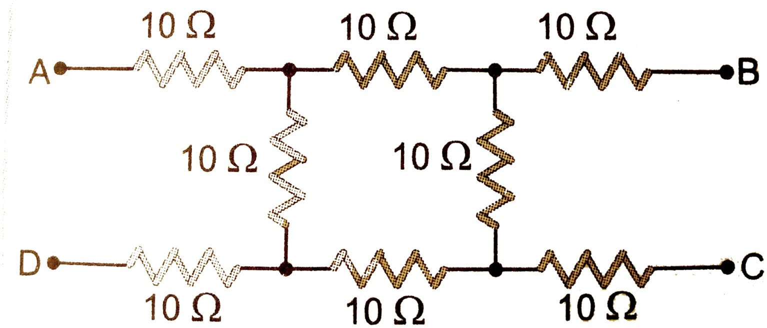
270. Find the resistance between the point (i) A and B and (ii) A and C of the network



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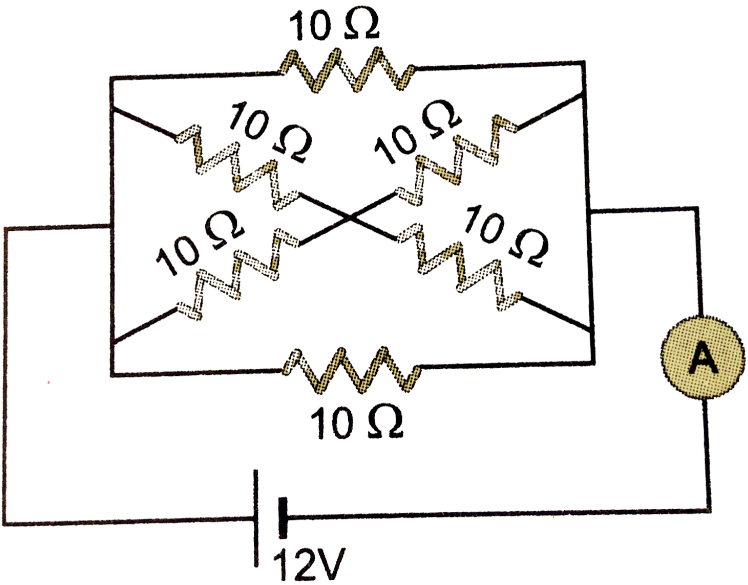
271. Calculate the current shown by the ammeter A in the circuit diagram



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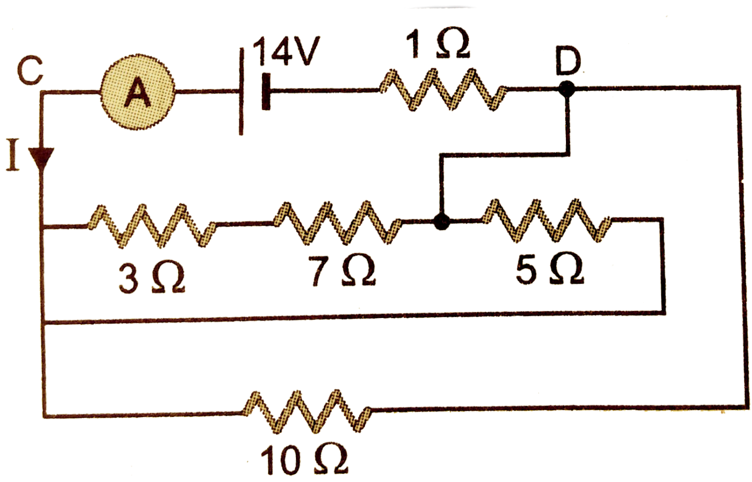
272. Find the ammeter reading in the circuit



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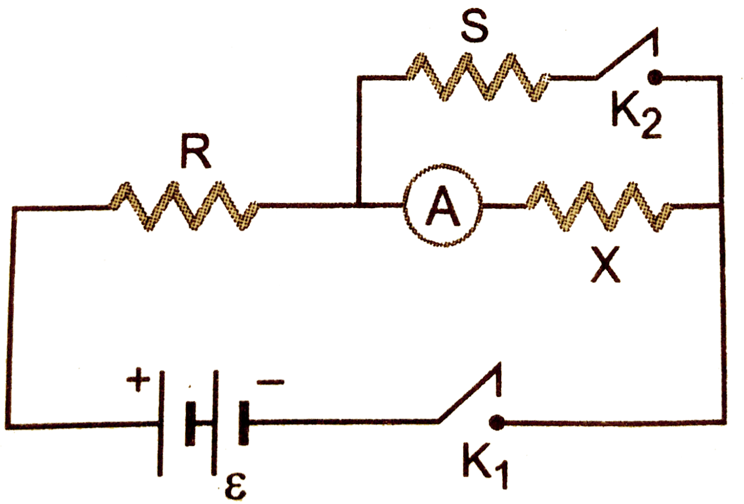
273. The reading of an ammeter in the circuit



(i) I when key K_1 closed key K_2 is open

(ii) $I/2$ when both keys K_1 and K_2 are closed

Find the expression for the resistance of X in terms of the resistances of R and S

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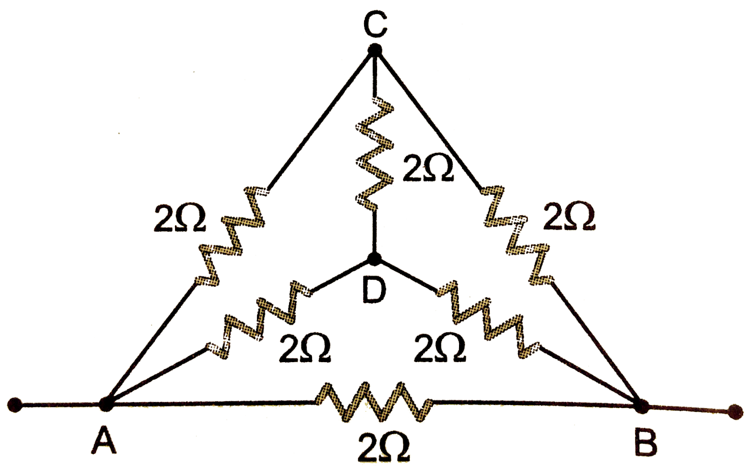
274. Find the equivalent resistance of the circuit between A and B



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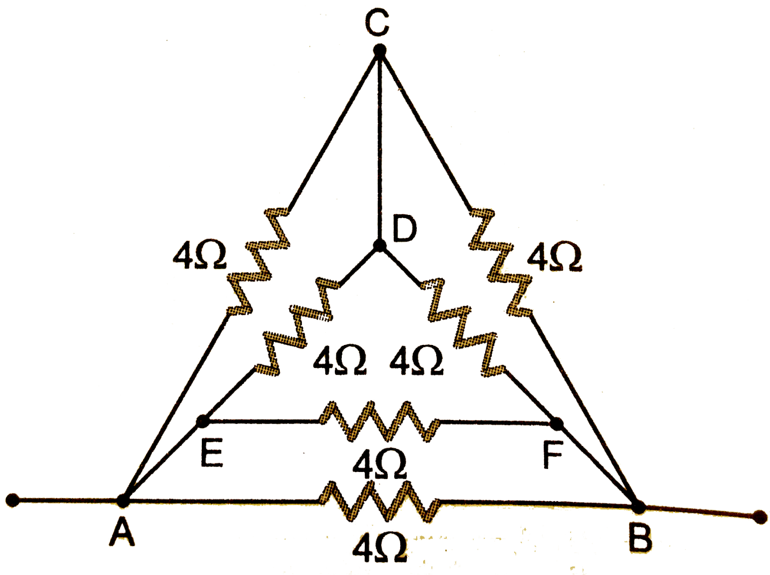
275. Find the equivalent resistance of the circuit between the points A and B



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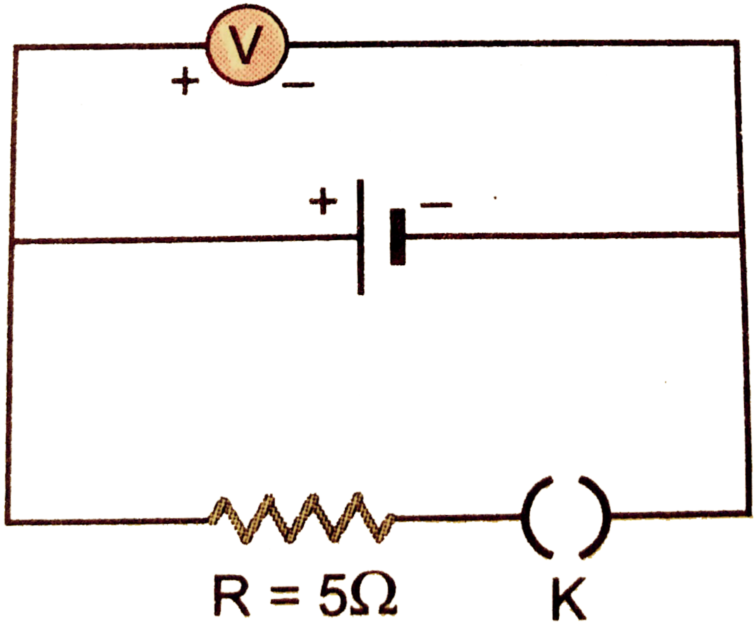
276. The reading on a high resistance voltmeter. When a cell is connected across it is $2.2V$. When the terminals of the cell are connected to a resistance of 5Ω the voltmeter reading drop to

$1.8V$. Find the internal resistance of the cell.



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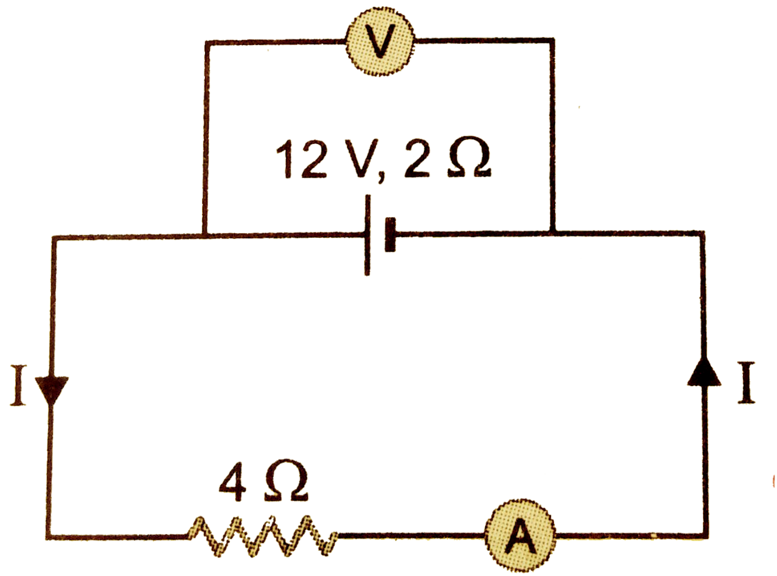
277. A battery of emf $12V$ and internal resistance 2Ω is connected two a 4Ω resistor. Show that the a voltmeter when placed across cell and across the resistor in turn given the same reading



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278. A cell of emf ε and internal resistance r is connected across a variable load resistance R. It is found that when $R = 4\Omega$ the current is $1A$

and when R is increased to 9Ω, the current reduces to $0.5A$. Find the value of the emf ε and internal resistance$r$

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279. A voltmeter of resistance 995Ω is connected across a cell of emf 3V and internal resistnace 5Ω. Find the potential difference across the voltmeter, that across the terminals of the cell and percentage error in the reading of voltmeter.

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280. A cell of emf ε and internal resistance r gives a current of 0.5 A with an external resistance of 12Ω and a current of 0.25 A with an external resistance of 25Ω. Calculate (a) internal resistance of the cell and (b) emf of the cell.

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281. The potential difference across terminals of a battry is $9.0V$, when a current of $3.5A$ flows through it from its negative terminal to the positive terminal .When a current of $2A$ flows through in the opposite direction, the terminal potential difference is $12V$. Find the internal resistance and emf of the battery

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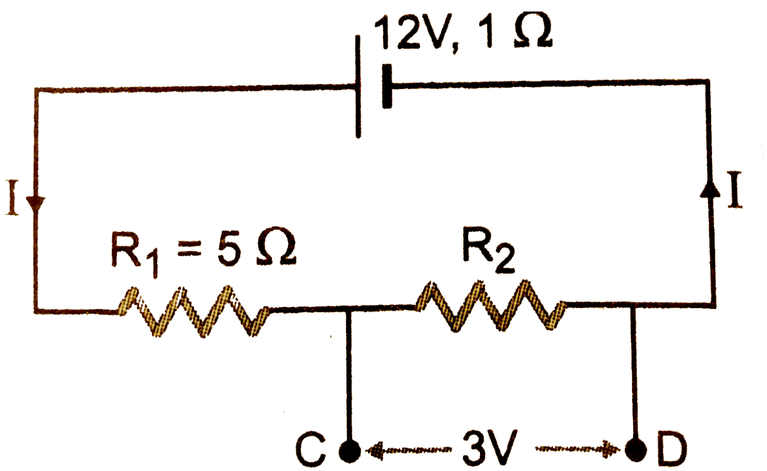
282. If the circuit a potential difference of $3V$ is required between the point C and D. Find the value of resistance r_2



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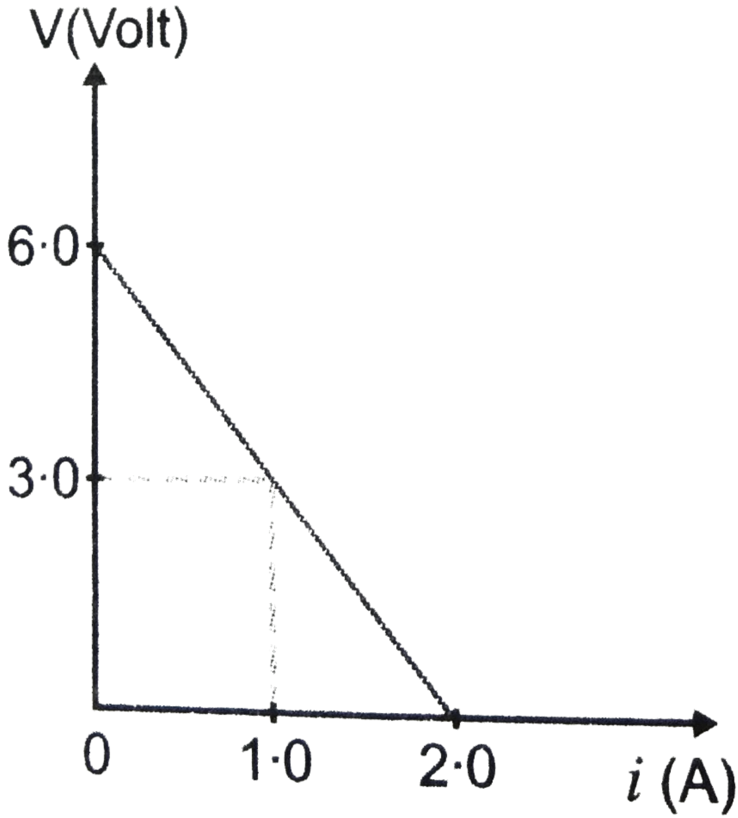
283. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor versus the current I :

(i) Calculate the emf of each cell. (ii) For what current I, will the power dissipation of the circuit

be maximum ?



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284. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor versus the current I :

(i) Calculate the emf of each cell. (ii) For what current I, will the power dissipation of the circuit

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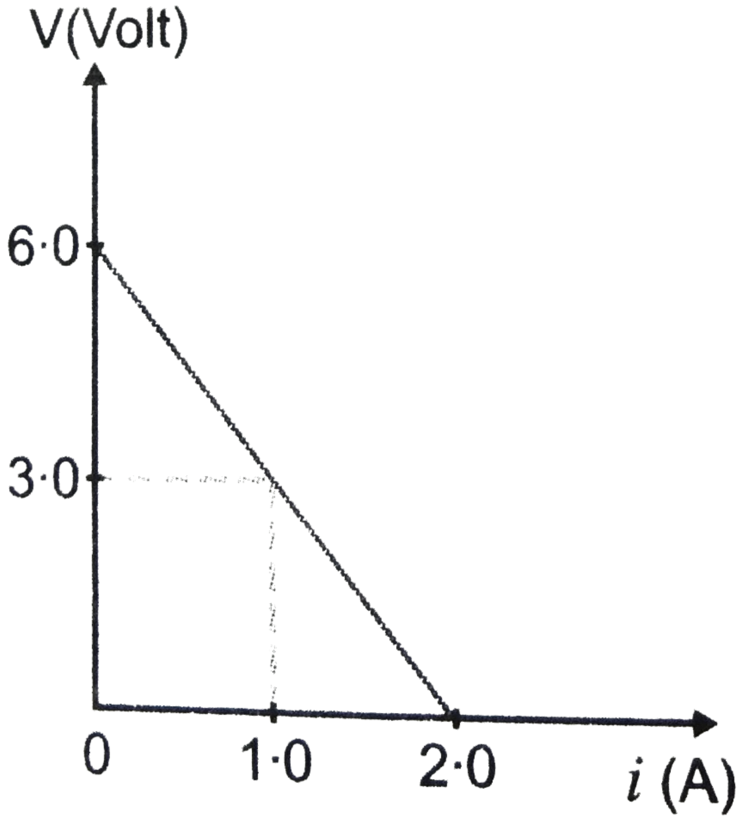

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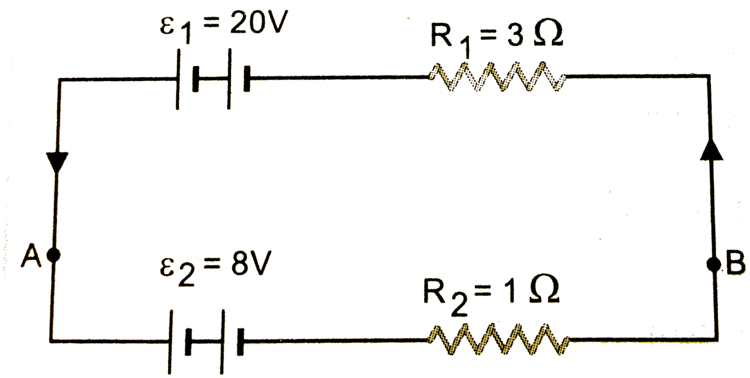
285. In the circuit find the potential difference between point A and B. Assume that both the batteries have zero internal resistance



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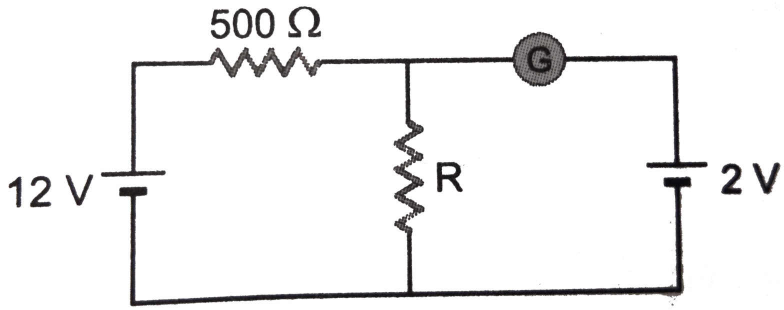
286. In the circuit the galvanometer G shows zero deflection. If the batteries A and B have negligible internal resistance find the value of the resitor R



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287. A voltmeter with resistance 500Ω is used to measure the emf of a cell of internal resistance 4Ω. The percentage error in the reading of the voltmeter will be

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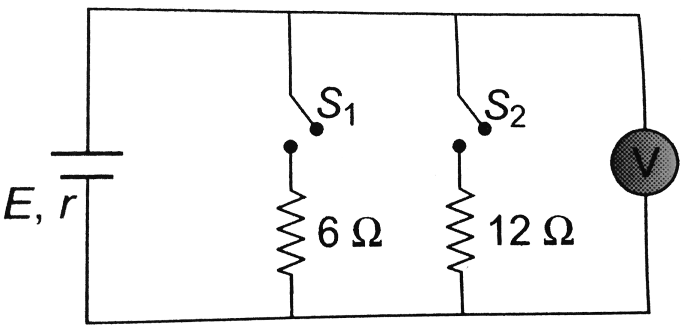
288. In the circuit shown, when switch S_1 is closed and S_2 is open, the ideal voltmeter shows a reaiding of $18V$. When switch S_2 is closed and S_1 is open, the reading of voltmeter is $24V$. When S_1 and S_2 both are closed, the voltmeter reading will be



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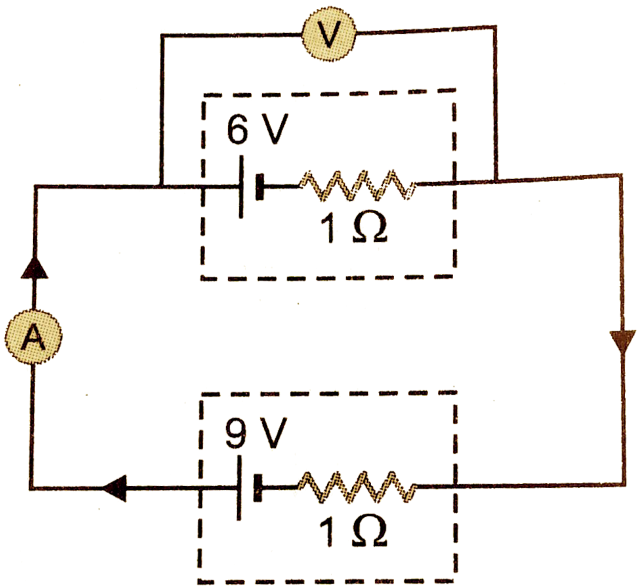
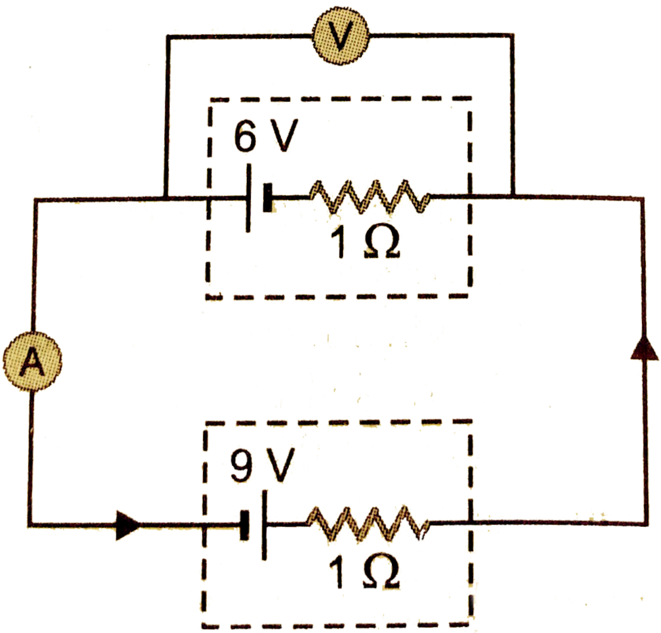
289. In the two electron circuit determine the readings of ideal ammeter (A) ideal voltmeter

(V)



a



b

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290. A cell of emf $1.1V$ and internal resistance 0.5Ω is connected to a wire of resistance 0.5Ω. Another cell of the same emf is connected in series bur the current in the wire remain the same .Find the internal resistance of second cell

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291. A set of 4 cell each of emf $2V$ and internal resistance 1.5Ω are connected across an external load of 10Ω with 2 rows, two cells in eacg row. Calculate the current in each row and potential difference across 10Ω

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292. 20 cell of internal resistance 0.5Ω and emf $1.5V$ are used to sent a current through an external resistance of (i) 500Ω (ii) 0.005Ω (iii) 2.5Ω. How would you arrange then to get the maximum current in each case ? Find the value of current in each case

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293. Find the minimum number of cells required to produce a current of $1.5A$ through a resistance of 30Ω. Given that the emf of each cell is $1.5V$ and the internal resistance is 1Ω.

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294. In identical calls are joined in series with its two cells A and B in loop with reversed polarties. EMF of each shell is E and internal resistance r.

Potential difference across cell A or B is (here $n > 4$)

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295. A set of 4 cell each of emf $2V$ and internal resistance 1.5Ω are connected across an external load of 10Ω with 2 rows, two cells in eacg row. Calculate the current in each row and potential difference across 10Ω

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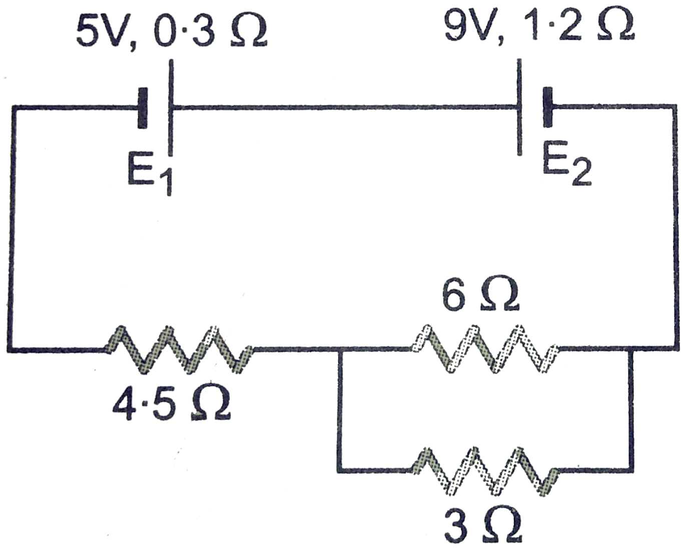
296. Two cells E_1 and E_2 in the circuit shown in figure, have emfs of 5 V and 9 V and internal resistance of 0.3Ω and 1.2Ω respestivley. Calculate the value of current flowing through the resistance of 3Ω.



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297. A student connects a cell of emf ε_2 and internal resistance r_2, with a cell of emf ε_1 such that their combinationhas a net internal resistance less then r_1. This combination in the connected across a resistance R. Draw a circuit of the 'set up' and obtain an external for the current flowing through the resistance R

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298. $1kg$ piece of copper is drawn into a wire $1mm$ thick and another piece into a wire $2mm$

thick. Compare the resistance of these wires.

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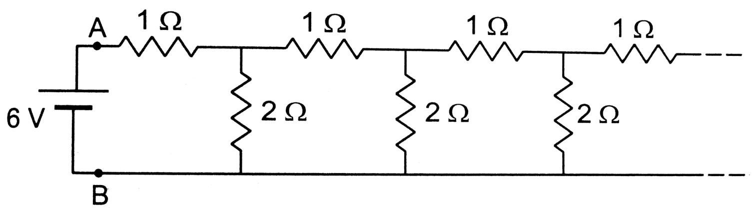
299. An infinite ladder is constructed with $1(\Omega)$ and $2(\Omega)$resistor as shown in figure.(a)Find the effective resistance between the point A and B. (b) Find the current that passes through the (2Ω) resistor nearest to the battery.



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300. A cell of emf $2V$ and internal resistance 0.1Ω supplies a current through a coil of resistance 11.0Ω. The current is being measured by an ammeter whose resistance is 6Ω. What reading does it give ? What is the percentage difference from the actual current, when the meter is not used ?

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301. You are given several identical resistors each of value 10Ω and each capable of carrying a maximum current of 1 A. It is required to make a suitable combination of these to resistances to produce a resistance of 5Ω which can carry a current of 4 A. The minimum number of resistors required for this job is

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302. Calculate the relaxation time and mean free path at room temperature (i.e. $27^{\circ}C$). If the number of free electrons per unit volume is $8.5 \times 10^{28} / m^3$ and resistivity $\rho = 1.7 \times 10^{8}\Omega - m$. Given that mass of electron $= 9.1 \times 10^{-31} kg$

$e = 1.6 \times 10^{-19} C$ and $k = 1.36 \times 10^{-23} JK^{-1}$

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303. Twelve cells each having the same e.m.f are connected in series and are kept to a closed box. Some of the cell are connected in reverse order .The battery is connected in series with an ammeter an external resistance R and two cells of the same type as an in the battery .The current when they and such each other is 3 ampere and current is 2 ampare when the two oppose each other. How many cells are connected in servese order ?

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304. A battery of emf E is connected with there resistance $R, 2R$ and R in series. The voltage across $2R$ is measured with a voltmeter whose resistance a $10R$ .What is the percentage error ?

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305. Voltmeters V_1 and V_2 are connected in series across a $D.C.$ line V_1 reads 80 volts and has a per volt resistance of $200 ohms$, V_2 has a total resistance of 32 kilo ohms.

The line voltage is

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306. 1 meter long metallic wire is broken into two unequal parts P and QP part of the wire in uniformly extended into another wire R. Length of R is twice the length of P and the resistance of R is equal to that of Q. Find the ratio of the resistance P and R and also the ratio of the length P and Q

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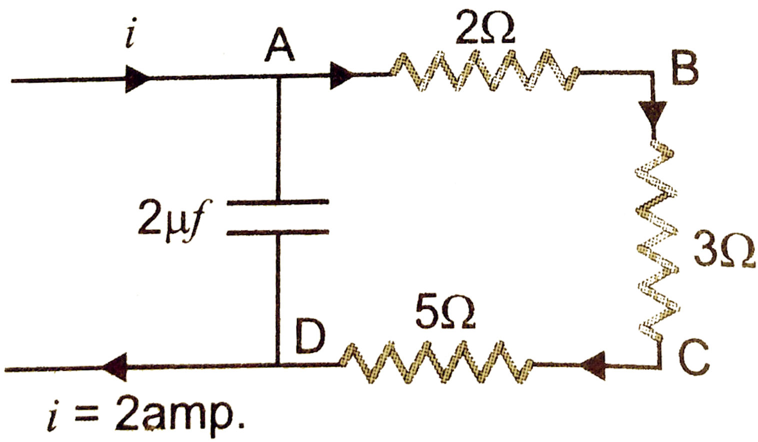
307. Calculate the energy stored in the condenser the given circuit



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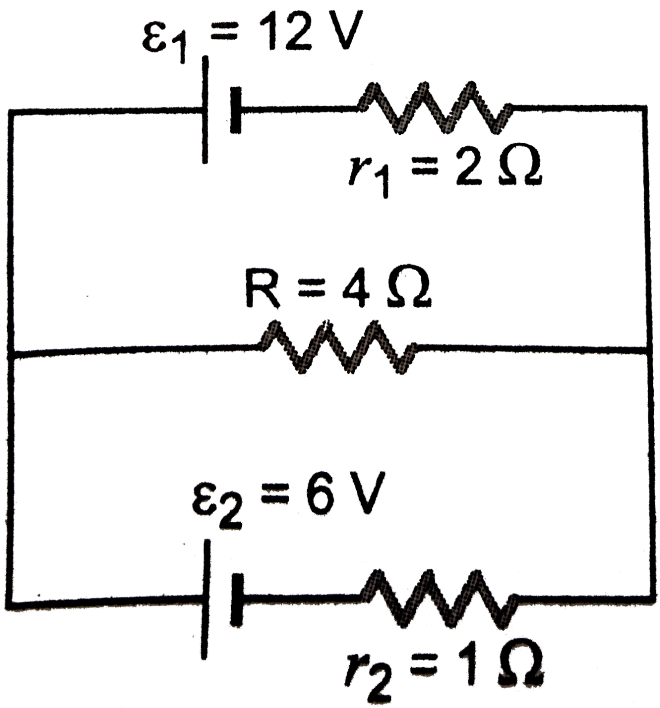
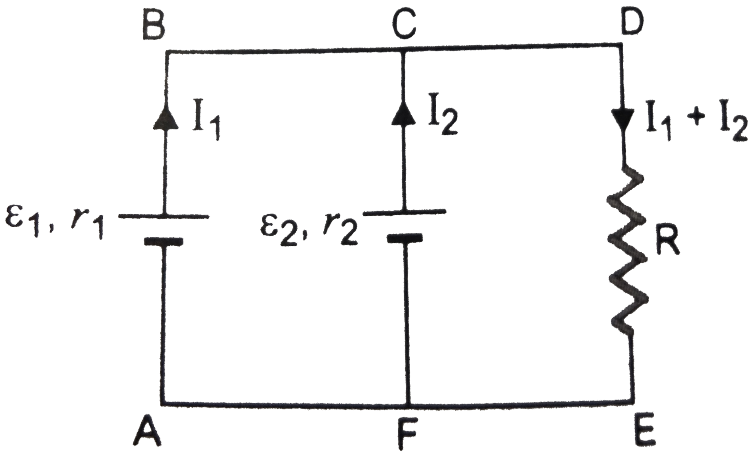
308. Find the potential difference across each cell and the rate of energy dissipated in R



309. The circuit diagram has two cells ε_1 and ε_2 with emf $4V$ and $2V$ respectively, each one having an internal resistance 2Ω. The external resistance $R$is of 8Ω. Find the magnitude and the direction of current flowing through the two cells



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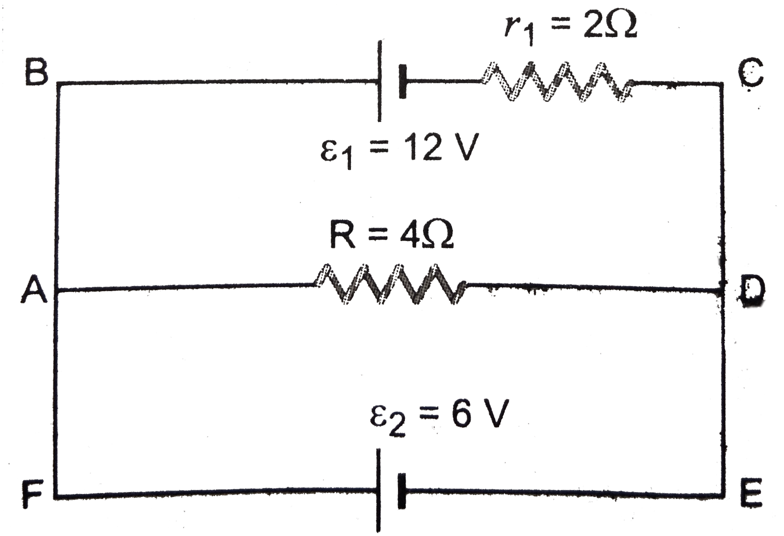
310. In the electron network. Kirchhoff's rule to calculate the power consumed by the resistance $R = 4\Omega$



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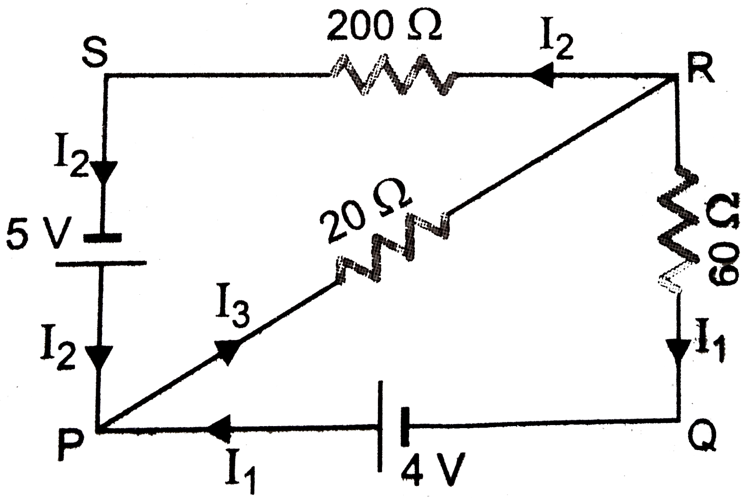
311. Apply kirchhoff's rules to the length $PRSP$ and $PRQP$ to wire the expression for the current I_1, I_2 and I_3 in the circuit



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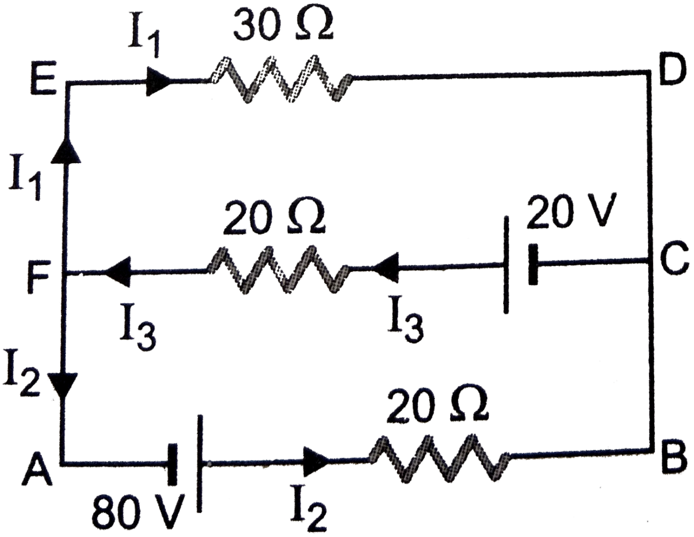
312. Use kirchhoff's rules to determine the value of current I_1 flowing in the circuit



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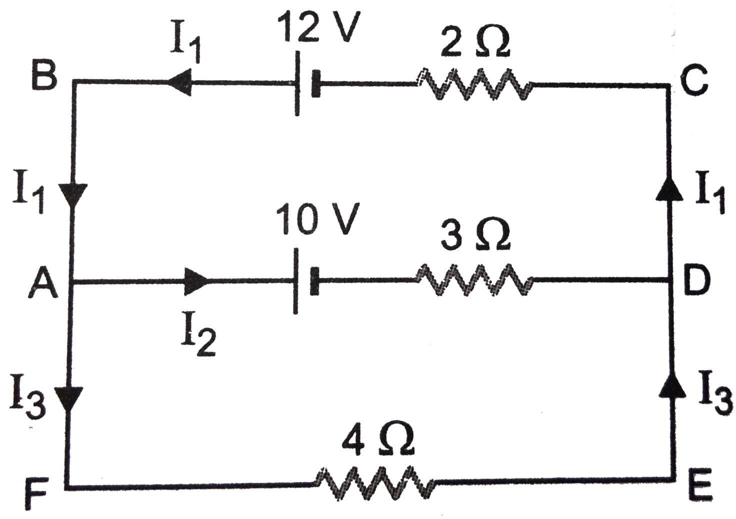
313. Using kirchhoff's laws, find the currents $I_1 I_2$ and I_3 of the network



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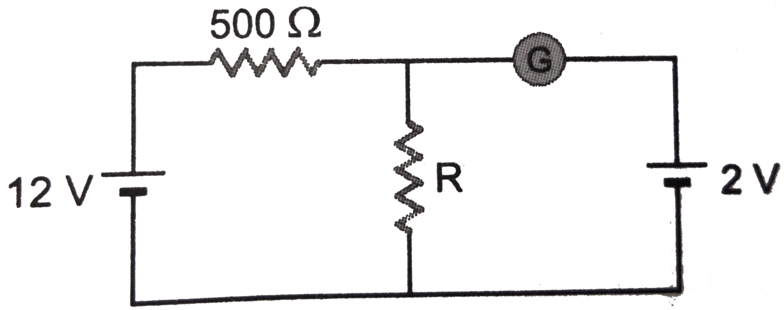
314. In the circuit the galvanometer G shows zero deflection. If the batteries A and B have negligible internal resistance find the value of the resitor R



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315. Three cell are connected in parallel with their like poles connected together with wires of negligible resistance .If the emf of the internal resistance are $4, 3 \text{ and } 2\Omega$ respectively, Find the current through each cell

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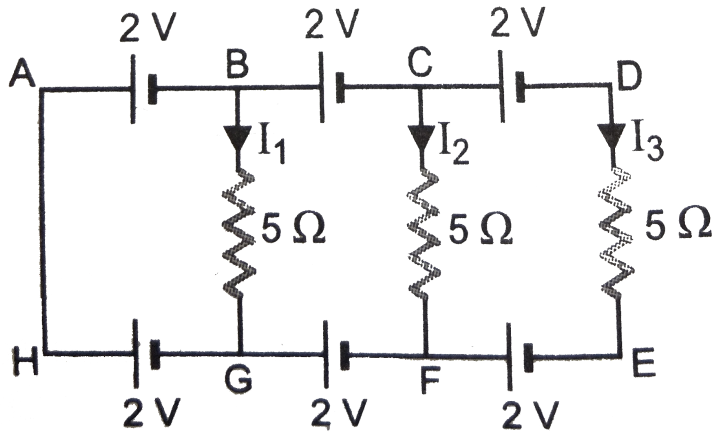
316. Find the current I_1, I_2 and I_3 through the there resistor circuit



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317. Twelve identical wires each of resistance 6Ω are arranged to from a skelence cube. A current of $40mA$ is led cube at the current and out at the diagonally opposite corner. Calculate the potential difference development across these current and the effective resistance of the network

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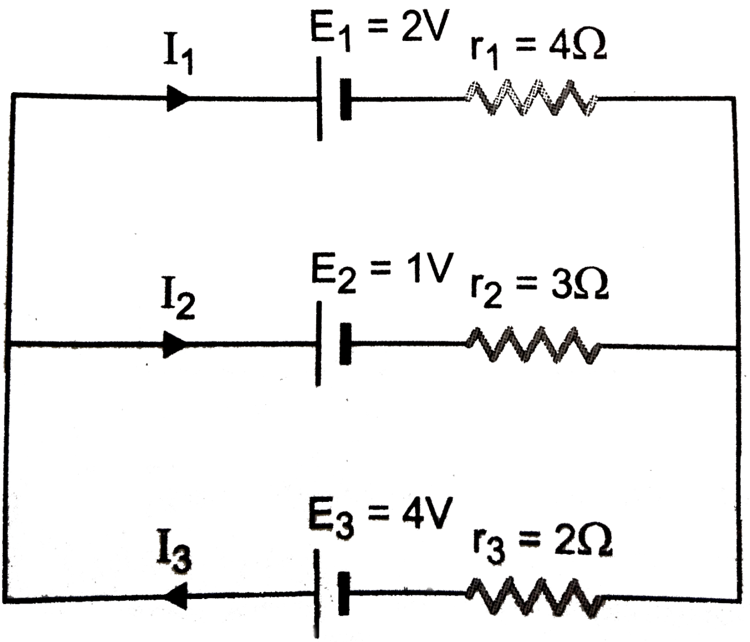
318. Using kirchhoff's rules wire the experssion for the current I_1, I_2 and I_3 in the circuit

diagram



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319. Twelve identical wires each of resistance 6Ω are arranged to from a skelence cube. A current of $40mA$ is led cube at the current and out at the diagonally opposite corner. Calculate the potential difference development across these current and the effective resistance of the network

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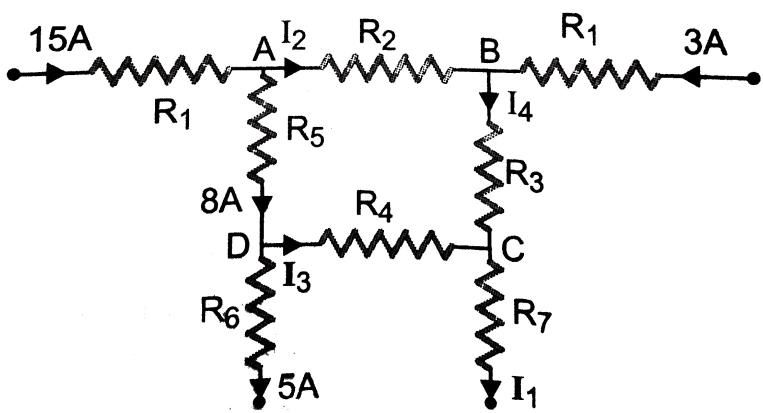
320. Calculate the value of current in the various arms of network



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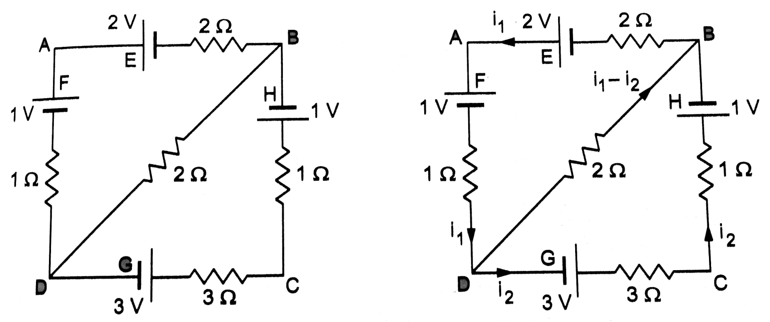
321. In the circuit shown in figure E,F, G and H are cell of emf 2,1,3, and $1V$ respectively. The resistances 2,1,3 and 1(Omega)are their respective internal resistance .Calculate (a)the potential difference between B and D and (b) the potential differences across the terminals of each of each of the cells G and H.



(a) (b)

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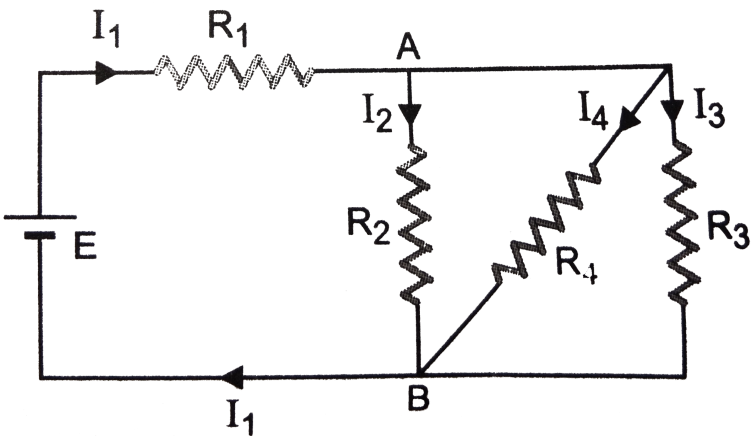
322. In the circuit

$R_1 = 4\Omega, R_2 = R_3 = 15\Omega R_4 = 30\Omega$ and $E = 10V$

Calculate the equivalent resistance of the circuit and current in each resistor



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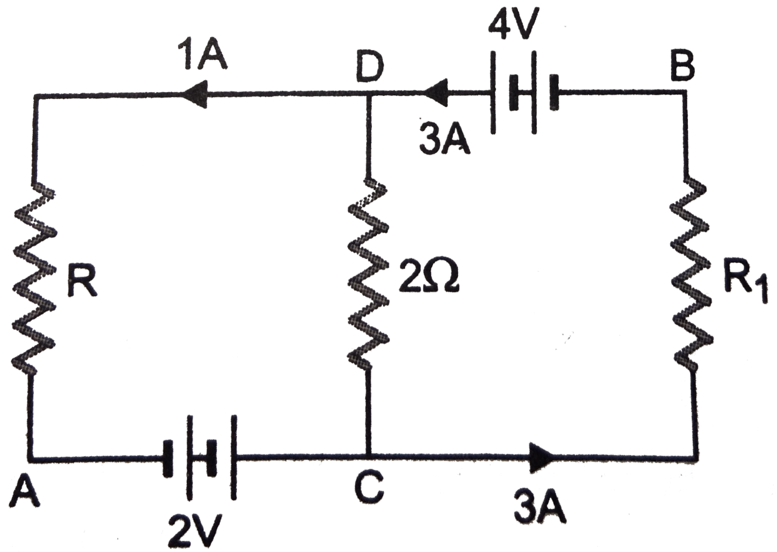
323. In the given circuit assuming poiny A to at zero potential use kirchhoff's rules to determine the potential at point B



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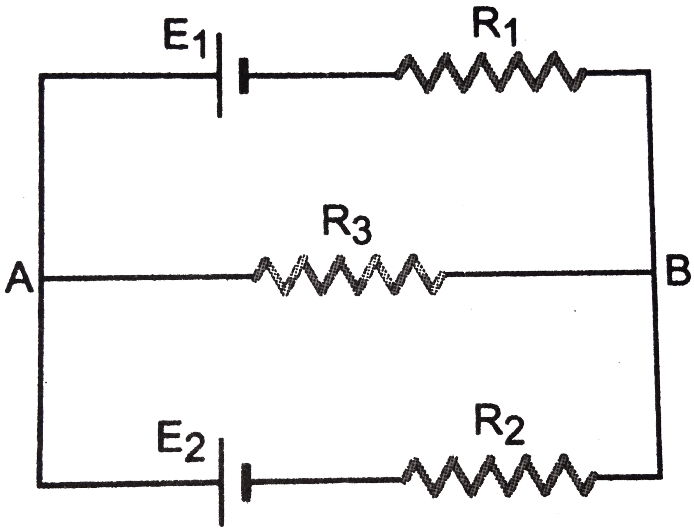
324. Find the potential differnce across R_2 in the circuit



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325. (i) In a meter bridge , the balance point is found to be at $30cm$ from the end A when resistance R in left gap of bridge is of 12Ω. Find resistance S in the right gap of bridge

(ii) If the cell and the galvanometer are interchanged in the balance point, would it effect flow of current through the galvanometer

(iii) Calculate the balance point of the bridge if R and S are interchanged

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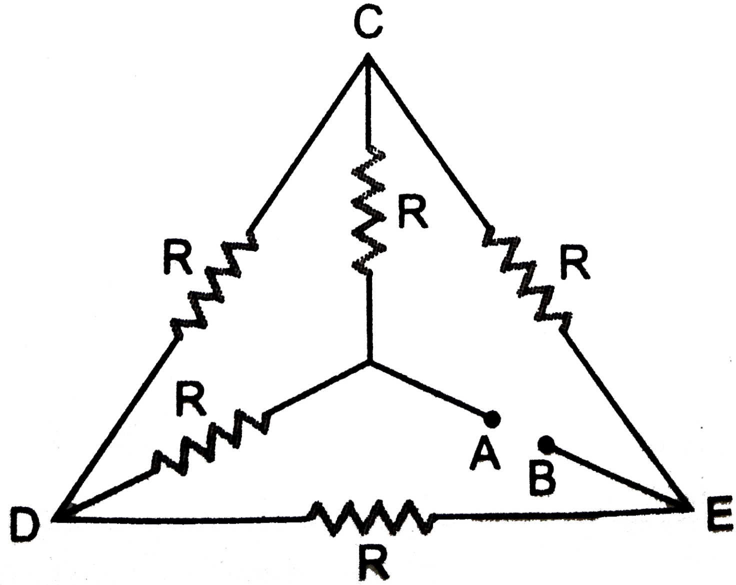
326. (i) Calcuate the equivalent resistance of the given electronical network point A and B of



(ii) Also calculate the current through ACB if a $10V$ d.c source is connected between A and B and th e value of R is is assumed as 2Ω

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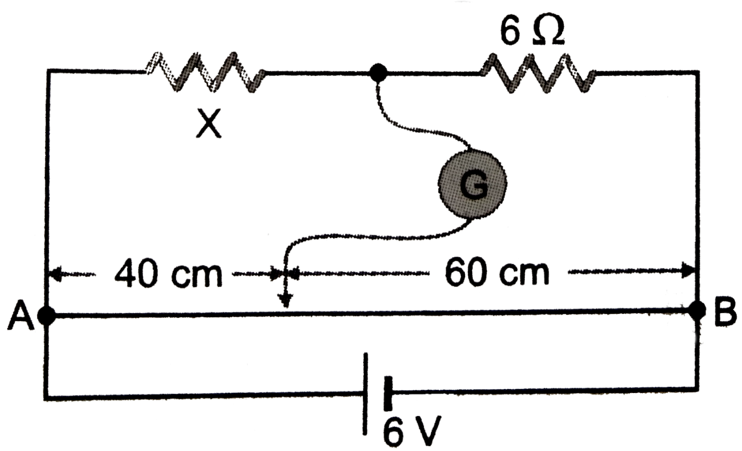
327. In the circuit a meter bridge a shown in the balanced state .The meter bridge wire has a resistance of $1\Omega / cm$. Calculate the unknown resistance Y and the current drawn from the battery of negiligible internal resistance



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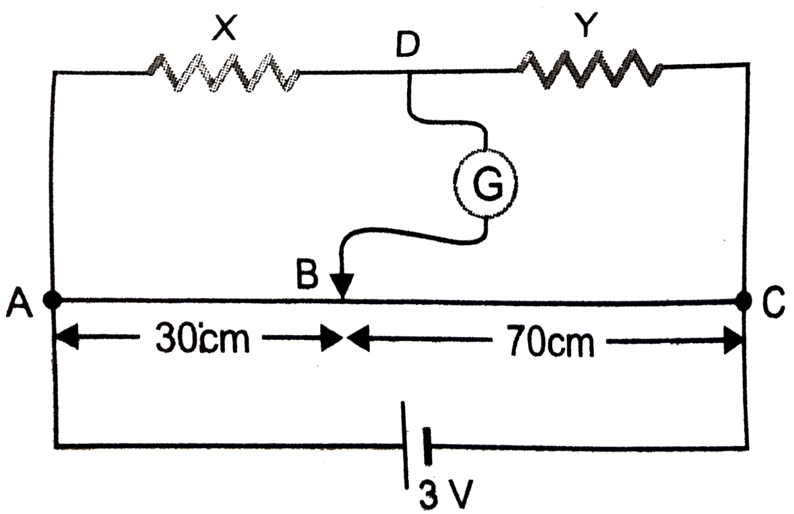
328. In the given circuit a bridge is shown in the balanced state.The meter bridge wire has a resistance of $1\Omega cm^{-1}$ .Calculate the unknown resistance X and the current drawn from the battery of negligible internal resistence. If the magnitude the position of galvanometer and the cell, how it will affect the position of the galvanometer ?



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329. In a Wheatstone bridge network P and Q the ratio area are approximately equal. When $R = 500\Omega$, the bridge is balanced on interchange P and Q the value of R for balance is 505Ω. Find the value of S and ratio $P:Q$

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330. In a meter bridge when the resistance in the left gap is 4Ω and an unknown resistance in the right gap the balance point is obtained at $40cm$ from the zero end. On shunting the unknown resistance with 4Ω, find the shift of the balance point on the bridge wire

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331. Four resistances of $16\Omega, 12\Omega, 4\Omega$ and 9Ω respectively are connected in cycle order so from a Wheatstone bridge. Calculate the resistance in be connected in parallel with 9Ω resistance to balance the bridge.

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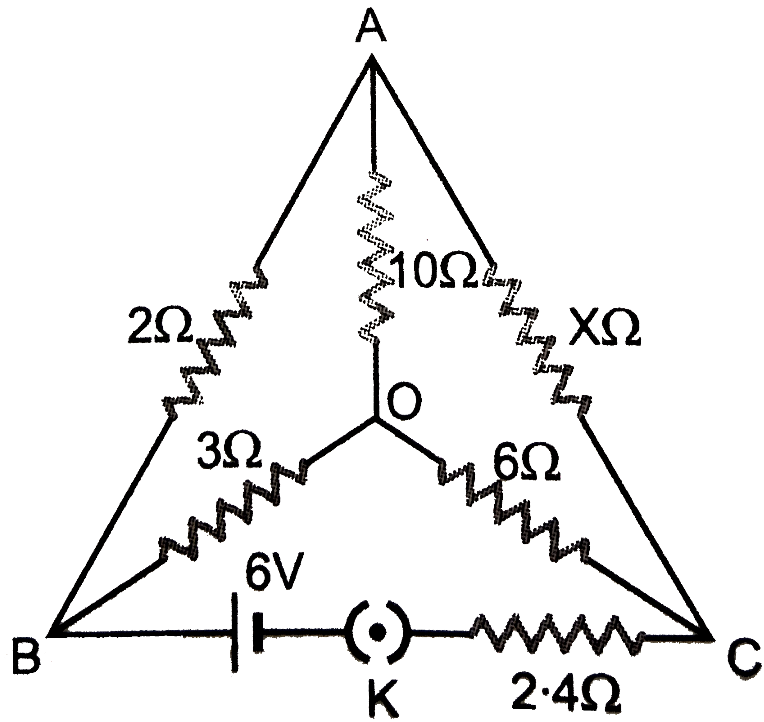
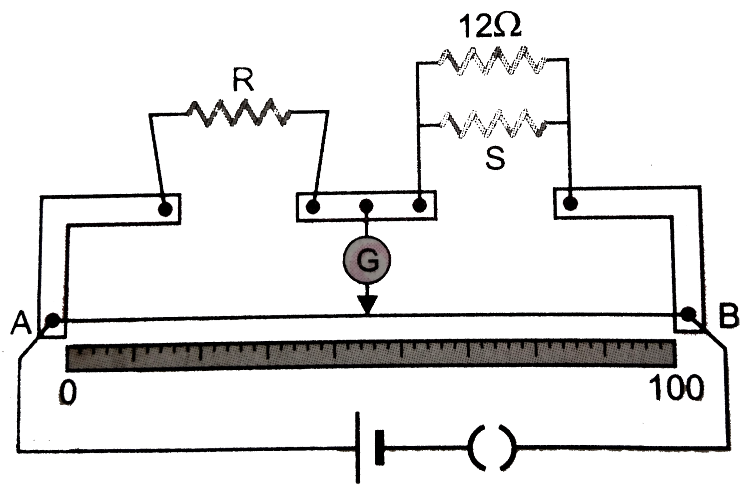
332. Find the value of the unknown resistance X, in the following circuit if no current flows through the arm AO from the battery of $6V$ and negligible internal resistance. Also find the Current flowing from the battery.



333. In a meter bridge, the null point is found at a distance of $40cm$ from A. If a resistance of 12Ω in connected in parallel with S the null point occurs at $50.0cm$ from A Determine the value of R and S



334. A resistance of 2Ω is connected across one gap of a meter bridge (the length of the wire is $100cm$ and an unknown resistance, greater than 2Ω, is connected across the other gap. When these resistance are interchanged, the balance point shifts by $20cm$. Neglecting any corrections, the unknown resistance is.

(a)3Ω

(b) 4Ω

(c) 5Ω

(d) 6Ω.

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335. In comparing the resistance of two cells P and Q with a sides wire bridge, a balance point is obtained when the sliding contact is $30cm$ from the zero end of the wire. The resistances P and Q are interchanged and the balance is obtained at $120cm$ from the same emf. Find the ratio of the resistance P and Q and the length of the bridge wire

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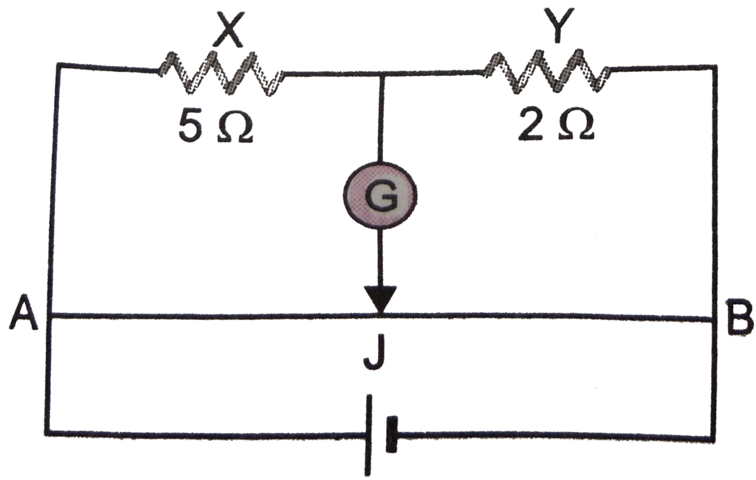
336. In the simple Wheatstone bridge circuit, where the length AB of bridge circuit wire is $1m$ the resistance X and Y have value 5Ω and 2Ω respectively, When X is shuted by a length of a wire the balance point to found to be $0.625m$ from A. What is the resistance of the shunt ? If the shunt is $0.75m$ long end 0.25 mm in diameter, what is the respectivity of the material of the wire ?



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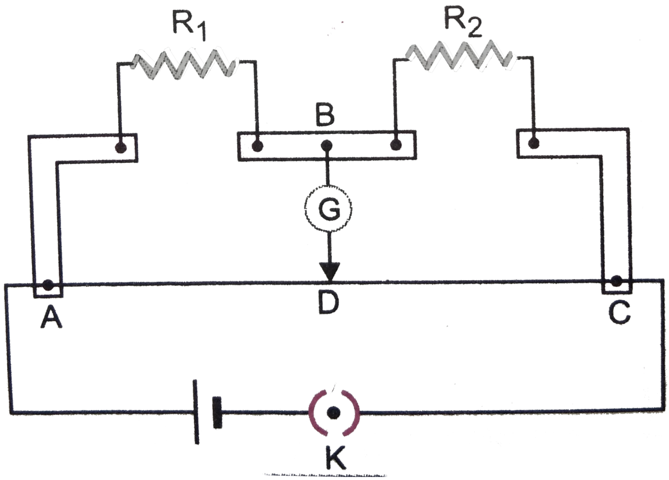
337. In the meterbridge experimental set up, shown the null point D is obtained at a distance of $40 cm$ from end A of the meter bridge wire if a resistance of 10Ω is connected in series with R_1, null point is obtained at $AD = 30cm$



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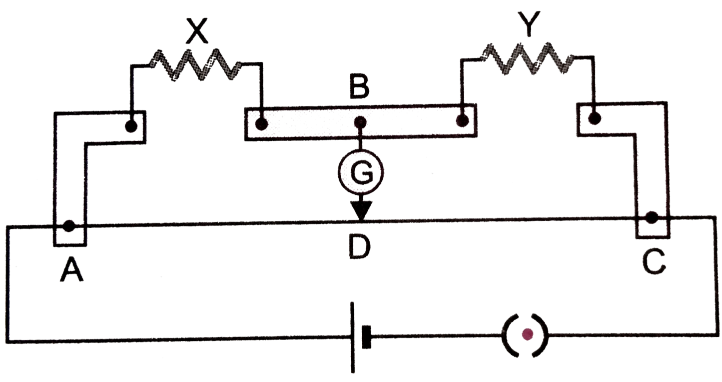
338. Experiment set up of a meter bridge .When the two unknown resistance X and Y are intserted, the null point D is obtained $40cm$ from the end A .When a resistance of 30Ω is connected in series with X the mill point shift by $10cm$ .Find the position of the point when the 30Ω resistance is connected in series with X, the null point shifts by 10 cm. Find the position of the null point when the 30Ω resistance is connected in series with resistance Y instead of X. Determine the values of resistances X and Y



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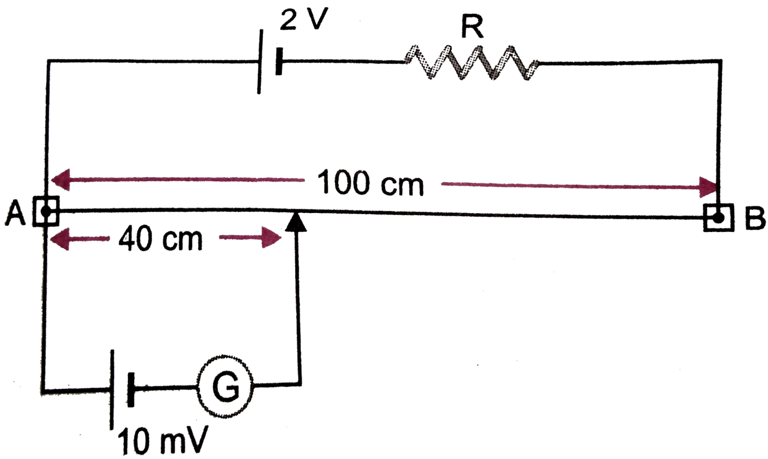
339. A potentiometer wire of length $100 cm$ having a resistance of 10Ω is connected in series with a resistance R and a cell of emf $2V$ of negligible internal resistance. A source of emf



of $10mV$ is balanced against a length of $40cm$ of the potentiometer wire. What is the value of resistance R ?

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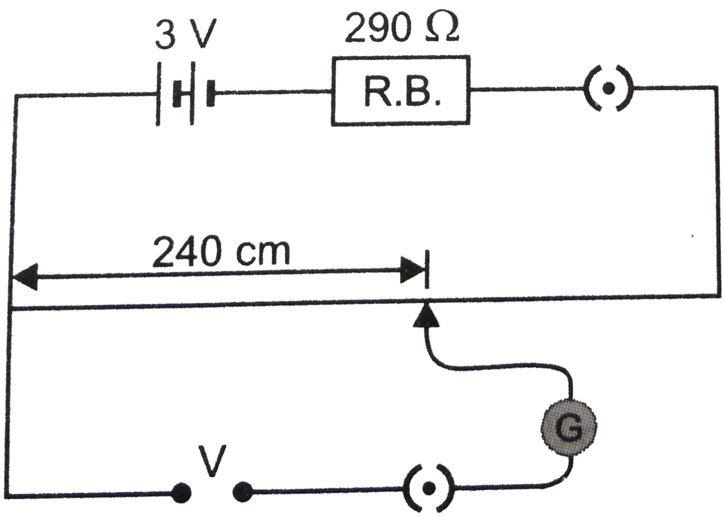
340. Calculate the value of unknown potential V for the given potentiometer circuit .The total length $400 cm$ of potentiometer wire has a resistance of 10Ω and the balance point in obtained at a length of $240 cm$



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341. In a potentiometer arrangement a cell of emf $1.20V$ given a balance point at $30cm$ length of the wire. The cell a now replaced by another cell of unknown emf. The ratio of emfs of the two cells is 1.5, calculate the difference in the balancing length of the potentiometer wire in the two cases

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342. In a potentiometer, a standard cell of emf $5V$ and of negligible resistance maintains a steady current through the galvanometer wire of length $5m$. Two primary cells of emfs ε_1 and ε_2 are joined in series with (i) same polarity and (ii) apposite polarity.The combination is connected through it galvanometer and a joined to the potentiometer. The balancing length is the two cases are found to be $350cm$ and 50 cm` respectively

(i) Draw the necessary circuit diagram

(ii) Find the value of emfs of the two cells

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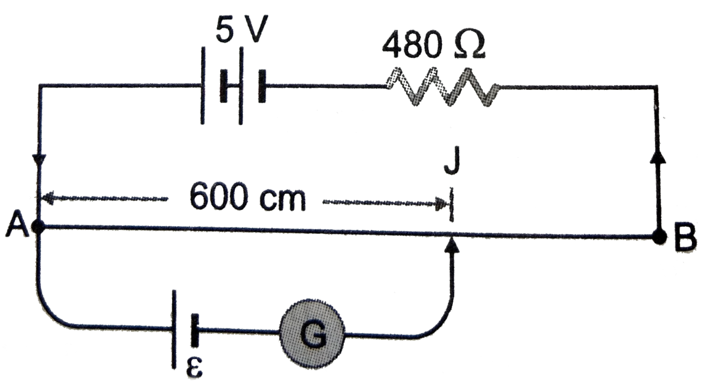
343. A 10 meter long wire of uniform cross section of 20Ω resistance is used as a potentiometer wire. This wire is connected in series with a battery of $5V$ along with an external resistance of 480Ω if an unknown emf ε is balanced at $600cm$ of this wire , calculate (i) the potential gradient of the potentiometer wire and (ii) the value of the unknown emf ε.



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344. The resistance of a potentiometer wire of length $10m$ is 20Ω. A resistance box and a 2 volt accumulator are connected in series with it. What resistance should be introduced in the box to have a potential drop of one microvolt per millimetre of the potentiometer wire ?

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345. With a certain cell the balance point is obtained at $70cm$ from the zero and of the potentiometer wire. With another cell whose emf differs from the $60cm$ mark .Calculate the emf of the two cells

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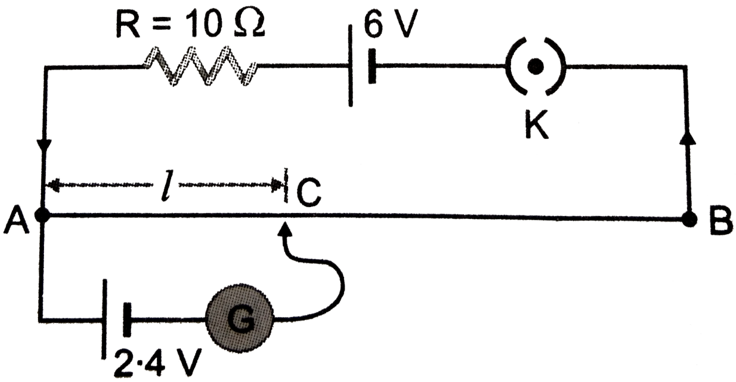
346. The potentiometer wire of length $200cm$ has a resistance of 20Ω. It is connected in series with a resistance 10Ω and an accumulator of emf $6V$ having negligible internal resistance. A source of $2.4V$ is balanced against length 1 of the potentiometer wire. Find the length l of the potentiometer wire. Find the length l



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347. A 2 volt battery, a 15Ω resistor and a potentiometer of $100cm$ length, all are connected in series. If the resistance resistance of potentiometer wire is 5Ω, then the potential gradient of the potentiometer wire is

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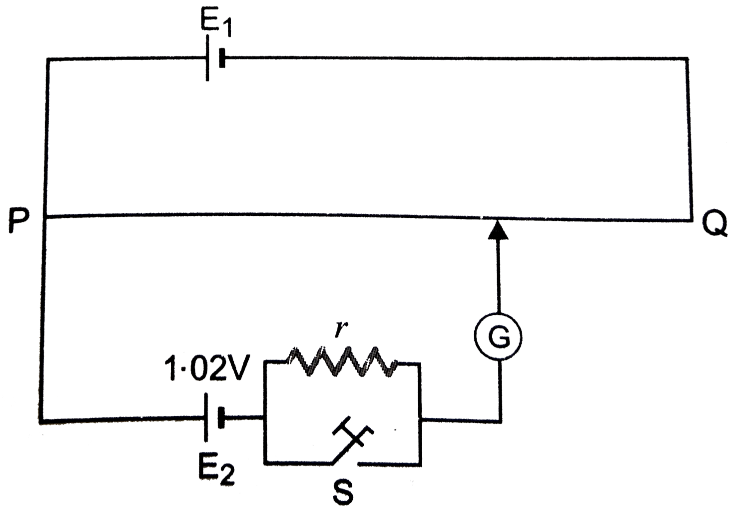
348. Potentiometer wire PQ of $1m$ length is connected to a standerd cell E_1. Another cell, E_2 of emf $1.02V$ is connected with a resistance r and a switch S open, null position is obtained at a distance of $51cm$ from P Calculate (i) potential gradient of the potentiometer wire and (ii) emf of the cell E_1 (iii) when swich S closed will mull point move toward P or toward Q ? Given resion for your answer ?



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349. A standerd cell emf $1.08V$is balance by the potential difference across $91cm$ of a meter long wire applied by a cell of emf $2V$ through a series resistor of resistance 2Ω. The internal resistance

of the cell is zero. Find the resistance per unit length of the potentiometer wire.

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350. A potentiometer having a wire $10m$ long stretched on it is connected to a battery having a steady voltage. A length of potentiometer wire is increase by $100cm$, find the new position of null point.

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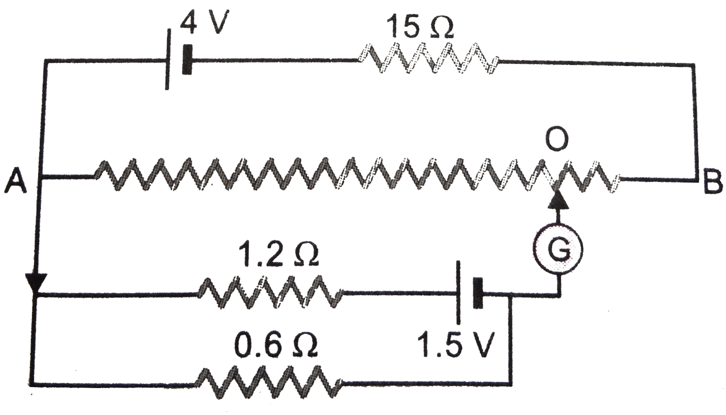
351. AB is 1 meter long uniform wire of 10Ω resistance. Other data are shown in the diagram. Calculate (i) potential gradient along AB (ii) length AO when galvanometer shown deflection



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352. In an experiment with a potentiometer to measure the internal resistance of a cell. when the cell in the secondary circuit is by shounted by 5Ω, the null point is at $220cm$. When the cell is shunted by 20Ω the null point is at $300cm$. Find the internal resistance of the cell.

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353. In an experiment of calibartion of voltmeter, a standard cell of emf $1.1V$ is balanced against $440cm$ of potentiometer wire. The potentilal difference across the ends of a resistance is found to balance against $220cm$ of the wire. The corresponding reading of voltmeter is 0.5 volt. Find the error in the reading of voltmeter.

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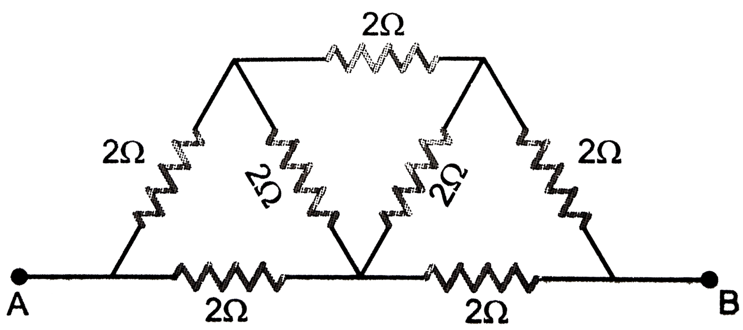
354. In the net work each resistance is 2Ω. Find th effective resistance between A and B



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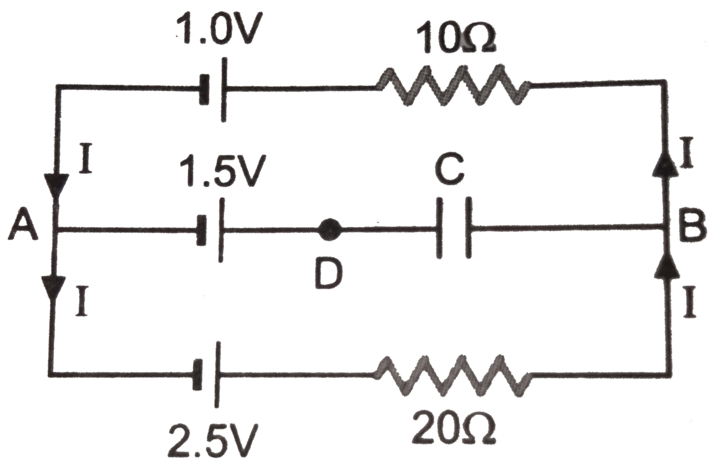
355. In the circuit diagram find the potential difference across the plates of capacitor C



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356. In a meter-bridge experiment with a resistance R_1 in left gap and a resistance X in a right gap. null point is obtained at $40cm$ from the left emf. With a resistance R_2 in the left gap, the null point is obtainned at $50cm$ from left hand. Find the position of the left gap is containing R_1 and R_2 (i) in series and (ii) in parallel.

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357. A battery of emf ε volt internal resistance r ohm is joined in series with two resistances X and Y ohm in a closed circuit. A standard cell of emf $1.06V$ and a galvanometer are joined in series and the combination is connected across X. The galvanometer shows no deflection when $X = 60\Omega$ and $Y = 224\Omega$ or when $X = 40\Omega$ and $Y = 140\Omega$ Calculate the values of E and r

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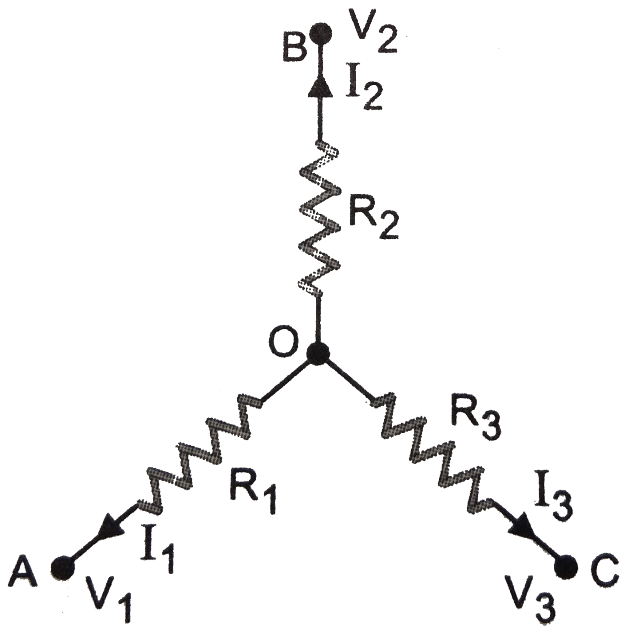
358. A circuit has a section ABC if the potential at point A, B and C are V_1, V_2 and V_3 respectively , calculate the potential at point O



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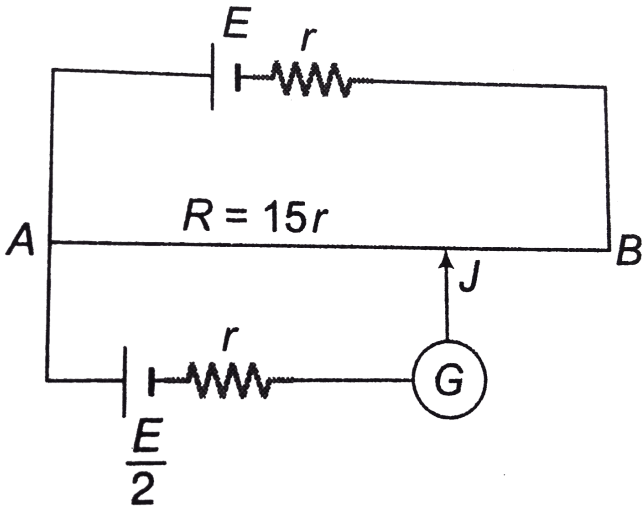
359. The potentiometer wire AB is 600 cm long.



a. At what distance from A should be jockey J touch the wire to get zero deflection i the galvanometer.

b. If the jockey touches the wire at a distance $560cm$ from A, what will be the current through the galvanometer.

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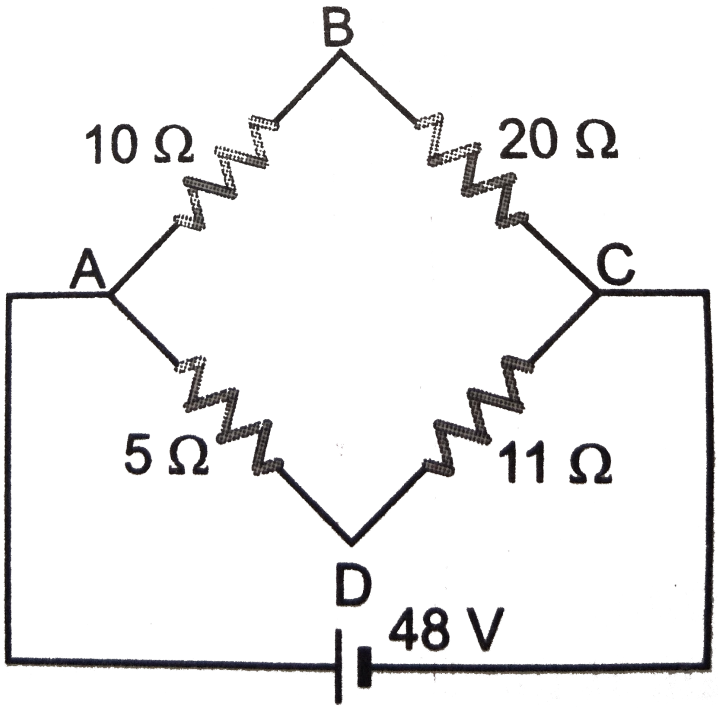
360. A Wheatstone bride is almost balanced with point C grounded. Calculate (a) the potential of point B (b) the potential of point D (c) If a galvanometer is connected between B and D, what is the direction of current through it ? (d) For what value of the resistance BC would the bridge be in balanced state ?



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361. A moter operating or $120V$ draw a current of $5A$. If the heat is developed in the motor at the one of 12 cells. What is in effeciency ?

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362. A generator is supplying power to a factory by cables of resistance 20Ω. If the generator is generating $50kW$ power as $5000V$, what is the power received by factory ?

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363. An electric motor operating on a $60V$ dc supply draws a currrent of $10A$. If the effeciency of the motor is 50%, the resistance of its winding is

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364. Calculate the amount of heat produced per second (in calories) when a bulb of $100W$, $220W$ glows, assuming that only 20% of electric energy is connected into light $J = 4.2Jcal^{-1}$

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365. Calculate the current flowing through a heater rated at $2kW$ when connected to a $300V$ d.c. supply.

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366. An electric motor operates on a $50V$ d.c. supply draw a current of $15A$. If the motor yields a mechanical power of $150W$ estimate the power dissipated across its windings. Also find the efficiency of the motor ?

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367. Find the resistance of $240V - 200$ watt electric bulb when glowing. If this resistance is 10 times the resistance at $0^{\circ}C$ and the temperature of the glowing filament is $2000^{\circ}C$, then find the temperature coefficient of resistance of the filament.

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368. Three equal resistances connected is series across a source of e.m.f consume 20 watt. If the same resistor are connected in parallel across the same source of e.m.f., what would be the power dissipated ?

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369. In a house having $220V$ line , the following appliances are operating :

(i) a $60W$ bulb, (ii) a $1000W$ heater , and (iii) a $40W$ radio.

Calculate (a) the current drawn by the heater and (b) the current passing through the fuse in the main line.

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370. A series battery of 10 lead accemulators each of emf $2V$ and internal resistor 0.25 ohm charged by a $220V$ d.c. mains. To limit the charging circuit a resistance of 47.5Ω is used in series in the charging circuit. What is (a) the power applied by the mains and (b) power dissipated as heat ?

(c) Account for the difference of power in (a) and (b)

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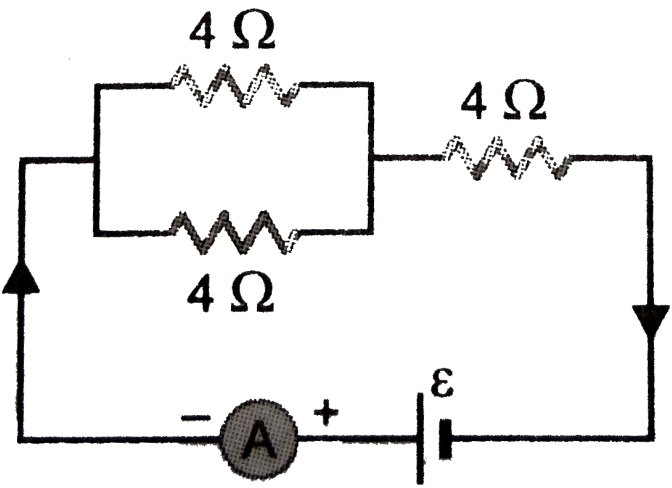
371. The resistance of each of the three wires, The combination of resistors is connected to a source of emf ε. The ammeter shows a reading of $1A$. Calculate the power dissipated in the circuit



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372. A dry cell of emf $1.6V$ and internal resistance of 0.10Ω is connected to a resistor of resistance $R\omega$. If the current drawn the cell is $2A$, then (i) What is the voltage drop across R ? (ii) What is the rate of energy dissipation in the resistor ?

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373. Two wires A and B of same material end mass have their length is the ratio $1:3$. On connecting them, one at a time in the same source of emf, the rate of heat dissipated in B is $10W$. What is the rate of heat dissipated in A ?

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374. An electric bulb is marked to $100W$, $220V$. If the supply voltage drops to $115V$, what is the heat end light energy produced by the bulb in 20 minutes. Calculate the current flowing through it.

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375. An electric bulb and electric heater are rated $100W$, $220V$ and $500W$, $220V$ respectively. Both are connected in series to a $220V$ d.c. mains.

Calculate the power consumed by (i) electric bulb and (ii) heater

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376. An electric kettle used to prepare tea, takes 2 minutes to boil 4 cups of water (1 cup contains 200 cc of water) if the room temperature is $25^{\circ} C$, (a) If the cost of power consumption is $Re1.00$ per unit $(1unit = 1000wa - hour)$, calculate the cost of boiling 4 cups of water. (b) What will be the corresponding cost if the room temperature drops to $5^{\circ} C$?

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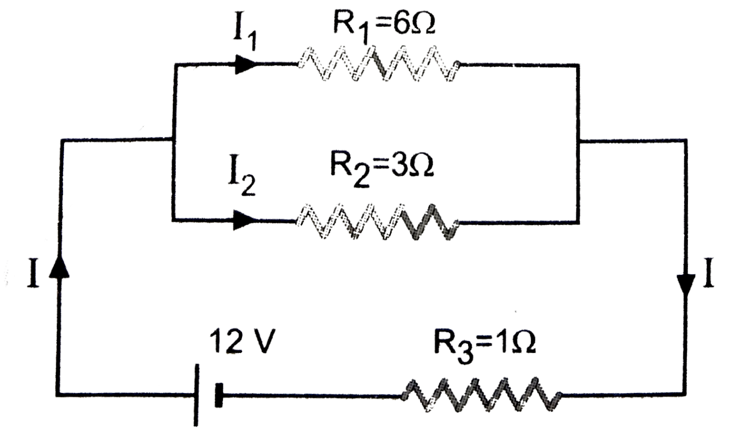
377. Find the heat developed per minutes in each of the three resistors R_1, R_2 and R_3



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378. A motor operating on $120V$ draws a current of $2A$. If the heat is developed in the motor at the rate of $9cals^{-1}$, what is the efficiency?

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379. An electric kettle was marked $500W, 220V$ and was found to raise 1 kg of water to 20° to the boiling point in 20 minutes. Calculate the heat efficiency of the kettle. Sp. Heat of water $= 4200Jkg^{-1}K^{-1}$.

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380. An electric kettle has two coils. When one coil is switched an it takes 5 minutes to boil water and when second coil is switched on it takes 10 minutes .How long will it take to boil water, when both the coil are used in series ?

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381. A room is lighted by $200W, 124V$ incandescent lamps fed by a generator whose output voltage is $130V$. The conducting wires from the generator to the user are made of aluminimum wire of total length 150 m and cross-sectional area $15mm^2$. How many such length can be installed ? What is the total power consumed by the user ? sp. resistance of aluminium is $2.9 \times 10^{-4} \Omega m$

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382. n identical bulbs are connected in series and illuminated by a power supply . One of the bulbs gets fused. The fused bulb is removed , and the remaining bulbs are again illuminated by the same power supply. Find the fractional change in the illuminated of (a) all the bulbs and (b) one bulb.

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383. A house is fitted with 20 length of 60 watt each 10 fans consuming 0.5 ampere each an electric kettle of resistance 110Ω. If the energy is supplied at $120V$ and costs 150 paise kWh, calculate monthly bill for running these appliances for 6 hours a day (1 length = 30 days).

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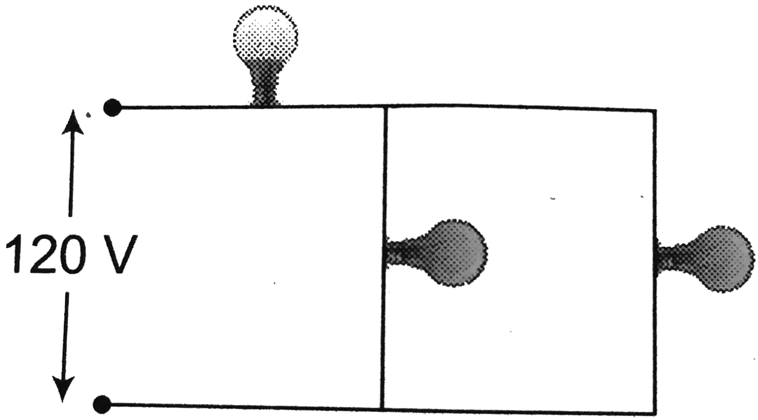
384. Three $60W$, $120V$ light bulbs are connected across a $120V$ power source. If resistance of each bulb does not change with current then find out total power deliver to the three bulbs.



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385. A house writing, supplied with a $220V$ supply line is protected by a 9 ampere fuse. Find the maximum number of 60 W in parallel that can be turned on.

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386. Find the cost of electricity for running an electric motor of 1 hp the 5 hrs a day at the rate of Rs 1.50 per unit of electricity for the month of November

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

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388. A cell sends a current through a resistance R_1 for time t, next the same cell sends current through another resistance R_2 for the time t If the same amount of heat is developed in both the resistance then find the internal resistance of the cell

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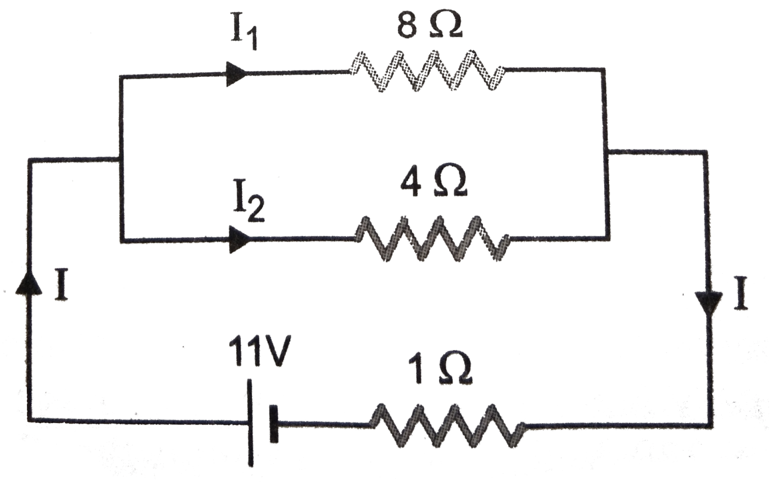
389. Find the heat developed per minute in each of the resistors.



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390. Water boils in an electric kettle in 15 minutes after switching on. If the length of the heating wire is decreased to $2/3$ of its initial value, then the same amount of water will with the supply voltage in

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391. Two bulbs of 500 watt and 200 watt are manufactured to operate on 220 volt line. The ratio of heat produced in $500W$ and $200W$, in two cases, when firstly they are joined in parallel and secondly in series, will be

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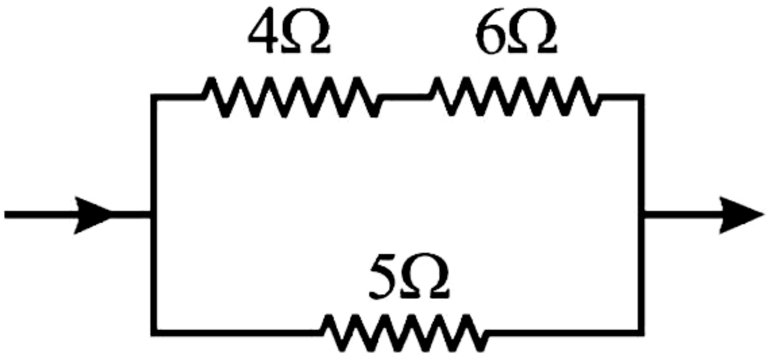
392. In the circuit shown in fig the heat produced in the 5 ohm resistor due to the current flowing through it is 10 calories per second.



The heat generated in the 4 ohms resistor is

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393. Two resistance R_1 and R_2 may be connected either in series or in parallel across a battery of zero internal resistance. It is required that the joule heating for the parallel combination be five times that for series combination if R_1 is 100Ω find R_2.

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394. 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.

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395. The same mass of copper is drawn into two wires $1mm$ and $2mm$ thick. These two wires are connected in series to the source of current .What is the ratio of the heat produced in the wires ?

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396. (i) A storage battery of emf $8V$, internal resistance 1Ω is being charged by a $120V$ d.c. source using a 15Ω resistor in series in the circuit. Calculate the current in the circuit (ii) terminal voltage across the battery during charging and (ii) chemical energy stored in the battery in 5 minutes.

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397. वृत्त के आकार में एक धारावाही तार (धारा I के साथ) पर विचार करें। ध्यान रहे कि जैसे-जैसे धारा तार में आगे बढ़ती जाती है वैसे-वैसे $\overrightarrow{J}$ (धारा घनत्व) की दिशा एक समग्र रूप से परिवर्तित होती है, जबकि धारा I अप्रभावित रहती है। इसके लिए आवश्यक रूप से उत्तरदायी है

A. source of emf

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

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

D. the charges ahead

Answer: B

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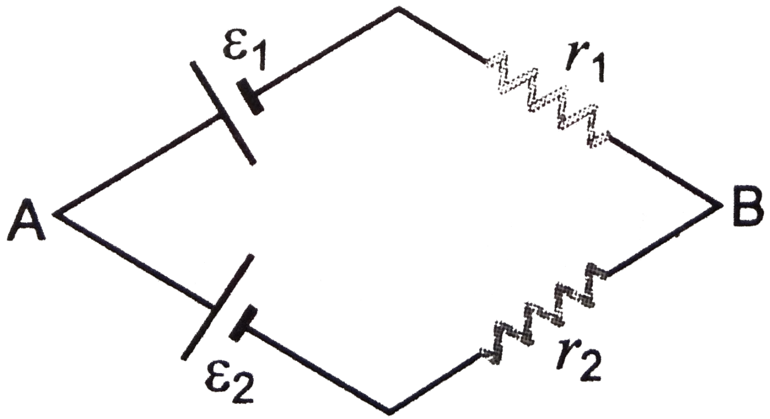
398. Two batteries of emf ε_1 and $\varepsilon_2 (\varepsilon_2 > \varepsilon_1$ and internal resistances r_1 and r_2 respectively are connected in parallel as shown in Fig. 2 (EP).1.



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

B. The quivalent emf ε_{eq} is smaller than ε_1

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

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

Answer: A

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399. A resistance R is to be measured using a meter bridge. Student chooses the standared resistance S to be 100Ω. He finds the null point at $l_1 = 2.9cm$. He is told to attempt to improve the accuracy. Which of the folllowing is a useful way?

A. He should measure l_1 more accurately

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

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

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

Answer: C

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400. Two cells of emfs approximately 5V and 10V are to be accurately compared using a poteniometer of length 400 cm.

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

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

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

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

Answer: B

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401. A metel rod of the length 10cm and a rectangular cross-section of 1 cm xx $1/2$ cm is connected to a battery across opposite faces. The resistance will be

A. maximum when the battery is connected across $1cm \times 1/2$ can faces

B. maximum when the battery is connected across $10 \times 1cm$ faces

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

D. same irrespective of the three faces

Answer: A

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402. Which of the follwing characteristies of electrons determines the current in a conductor?

A. Drift velocity alone

B. Thermal velocity alone

C. Both drift velocity and thermal velocity

D. Neither drift nor thermal velocity

Answer: A

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403. Kirchoff's junction rule is a reflection of

A. conservation of current density vector

B. conservation of charge

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

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

Answer: B::D

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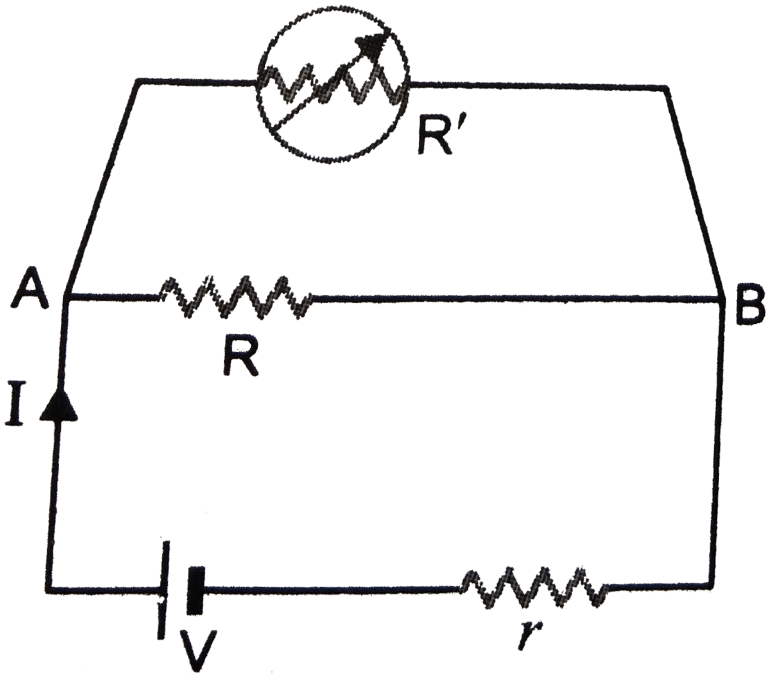
404. Consider a simple circuit shown in Fig. 2(ET).2. stands for a variable resistance R'.R' can vary from R_0 to infinity. r is internal resistance of the battery $(r < \; < R < \; < lR_0)$



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

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

C. Current I depends sensitively on R'

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

Answer: A::D

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

A. number of charge carriers can change with temperature T

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

C. length of material can be a function of T

D. mass of carriers is a function of T

Answer: A::B

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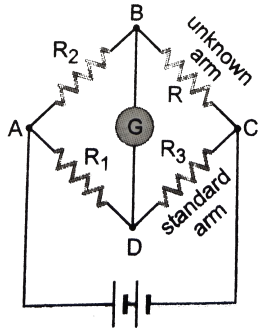
406. The measurement of an unknown resistance R is to be carried out using Wheatstone bridge (see Fig. 2(EP).3). Two students perform an experiment in two way. The first student takes $R_2 = 10\Omega$ and $R_1 = 5\Omega$. The other student takes $R_2 = 1000\Omega$ and $R_1 = 500\Omega$. In the standard arm, both take $R_3 = 5\Omega$. Both find $R = \frac{R_2}{R_1} R_3 = 10\Omega$ within errors.

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



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

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

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

Answer: B::C

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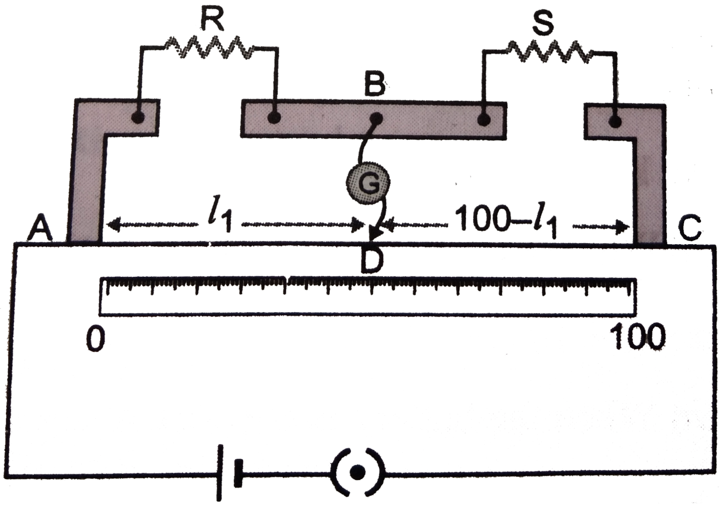
407. In a meter bridge the point D is a neutral point (Fig. 2(EP).4).



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

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

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

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

Answer: A::B::C

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1. A cylindrical copper conductor AB length L areaa of cross-section a has large number of free electrons which at mean temperature move at random within the body of the conductor like the molecules of a gas. The average thermal motion at room temperature is of the enter of $10^5 ms^{-1}$ where a potential difference V is applied free electronic in the condictior experience , the free electrons in the conductor experience force and are accelerated towards the positive emf of the condutor on their gained kinetic energy After each collision the free electronic are angle acceleration due of the electric field , towards the positive end the conductor and next collision with the ions/atoms of the electrons The average speed of the free electrons with which they drift toward the positive and of the conductor under the effect of applied electric field is called drift of the electrons

When the potential difference is applied the two ends of the conductors , an electric field exists

A. outside the conductor

B. inside the conductor

C. both outside and inside the conductor

D. no where

Answer: b

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2. A cylindrical copper conductor AB length L areaa of cross-section a has large number of free electrons which at mean temperature move at random within the body of the conductor like the molecules of a gas. The average thermal motion at room temperature is of the enter of $10^5 ms^{-1}$ where a potential difference V is applied free electronic in the condictior experience , the free electrons in the conductor experience force and are accelerated towards the positive emf of the condutor on their gained kinetic energy After each collision the free electronic are angle acceleration due of the electric field , towards the positive end the conductor and next collision with the ions/atoms of the electrons The average speed of the free electrons with which they drift toward the positive and of the conductor under the effect of applied electric field is called drift of the electrons

The motion of electrons in between two successive collisions with the atoms/ions follows

A. a straight path

B. circular path

C. elliptical path

D. curved path

Answer: d

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3. A cylindrical copper conductor AB length L areaa of cross-section a has large number of free electrons which at mean temperature move at random within the body of the conductor like the molecules of a gas. The average thermal motion at room temperature is of the enter of $10^5 ms^{-1}$ where a potential difference V is applied free electronic in the condictior experience , the free electrons in the conductor experience force and are accelerated towards the positive emf of the condutor on their gained kinetic energy After each collision the free electronic are angle acceleration due of the electric field , towards the positive end the conductor and next collision with the ions/atoms of the electrons The average speed of the free electrons with which they drift toward the positive and of the conductor under the effect of applied electric field is called drift of the electrons

The drift speed of the electrons depends on

A. dimension of the conductor

B. number density of free electrons in the conductor

C. both (a) and (b)

D. none of these above

Answer: d

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4. A cylindrical copper conductor AB length L areaa of cross-section a has large number of free electrons which at mean temperature move at random within the body of the conductor like the molecules of a gas. The average thermal motion at room temperature is of the enter of $10^5 ms^{-1}$ where a potential difference V is applied free electronic in the condictior experience , the free electrons in the conductor experience force and are accelerated towards the positive emf of the condutor on their gained kinetic energy After each collision the free electronic are angle acceleration due of the electric field , towards the positive end the conductor and next collision with the ions/atoms of the electrons The average speed of the free electrons with which they drift toward the positive and of the conductor under the effect of applied electric field is called drift of the electrons

The speed of electrons in a conductor is small $\left(=10^{-4}ms^{-1}\right)$ when the switch is closed, the bulb at a distance glows immediately. It is so because

A. drift velocity of electrons increase when swich in closed

B. electrons are accelerated towards the position end of the conductor and their velocity increase toward the other end of the conductor

C. the drifting of electrons takes place at the enter length of the connecting wire This electrics effective propagates with the speed of light

D. the electrons towards the position end and protons of condictor move toward negative end of the conductor

Answer: c

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Interger Type

1. Refer .for what value of R (in ohm) will the current in galvanmeter G be zero

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2. In the circuit What should be the value of r in ohm so that power developed in the resistor r will be maximum ?

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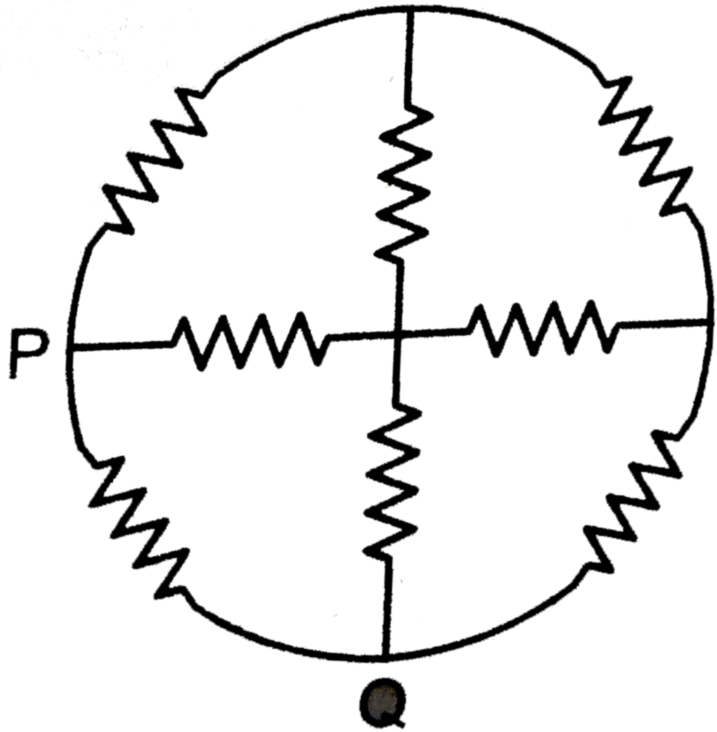
Assertion and Reason

1. Assertion : The effective resistance of the network between P and Q is $\frac{4}{5}r$



Reason : Symmetry can be applied to the network

with respect to center

A. both assertion and reason are true and the

reason is Assertion and Reason explanation

of the Assertion

B. both assertion and reason are true and the reason is Assertion and the correct explanation of the Assertion

C. Assertion is true , but the reason is false

D. both assertion and reason are false

Answer: d

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2. Assertion : The resistance of super-conductor is zero.

Reason : The super-conductors are used for the transmission of electric power.

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: b

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3. Statement- 1 : The conductivity of electrolyte is very low, than that of metal at room temperature

Statement-2 : The resistance of solution electrolyte is high than metal. The ions in electrolyte drift much more slowly thin electrons in metal under the given electric field

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: a

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4. Statement- 1 : When the cell is in the open circuit, there is no force on a test charge inside the electrolyte is in the cell

Statement-2 : Three is no field inside the cell, when is it open circuit.

A. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is correct explanation of statement - 1,

B. Statement - 1: is true ,Statement - 2: is true ,Statement - 2: is not a correct explanation of statement - 1,

C. statement - 1 is correct and statement - 2 is false

D. statement - 1 is false and statement - 2 is true

Answer: c

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Fill in the blanks

1. The balanced position of meter bridge is ...... interchanging the positions of battery and galvanometer

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2. The potentiometer is an ......as if measures the emf of a cell very accurately

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3. A voltmeter is an ....as it measure the

....

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4. For steady current to be extablished in a closed circuit, there must be some part circuit in which...... increases in the direction of current

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Problems for Practice (A)

1. A standard coil marked 3W is found to have a true resistance of 3.115 W at 300 K. Calculatge the temperature at which marking is correct. Temperature coefficient of resistance of the material of the coil is $4.2 \times 10^{-300C^{-1}}$.

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Problems for Practice (B)

1. Twelve identical wires each of resistance 6Ω are joined to from a skeleton cube. Find the

resistance between the current of the same edge of the cube

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2. P, QR and S four resistance wires of resistance $1, 2, 3$ and 4 ohm respectivily. They are connected in form the four arms of Wheatstone bridge circuit. Find out the resistance with which S meat be shunted in order the bridge may be balanced

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