# PHYSICS

## BOOKS - DHANPAT RAI & CO PHYSICS (HINGLISH)

## CURRENT ELECTRICITY

**Example**

**1.** $10^{20}$ electrons, each having a charge of `1.6xx10^(-19) C, pass from a point A towards another point B in 0.1 s. What is the current in ampere ? What is its direction ?

Watch Video Solution

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

Watch Video Solution

**3.** How many electrons pass through a lamp in one minute, if the current is 300 mA ?

Watch Video Solution

**4.** How many electrons per second flow through a filament of a 120 V and 60 W electric bulb ?

Watch Video Solution

**5.** 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 $6.8 \times 10^{15}$ revolutions per second. Find the equivalent current at may point on the orbit of the electron

Watch Video Solution

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

Watch Video Solution

**7.** An electron beam has an aperture of $1.0mm^2$. A total of $6 \times 10^{16}$ electrons flow through any perpendicular cross-section per second. Calculate (i) the current (ii) the current density in the electron beam.

Watch Video Solution

**8.** 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 $= 6.37 \times 10^6 m$.

Watch Video Solution

**9.** The amount of charge passed in time t through a cross-section of a wire is

$Q(t) = At^2 + Bt + C.$

(a)Write the dimensional formulae for A,B and C.

(b) If the numerical values of A,B,and C are 5,3 and 1 respectively in SI units,find the value of the current at t=5 s.

Watch Video Solution

**10.** In a discharge tube, the number of hydrogen ions (i.e., protons) drifting across a cross-section per second is $1.0 \times 10^{18}$, while the number of electrons drifting in the opposite direction across another cross-section is $2.7 \times 10^{18}$ per second. If the supply voltage is 230 V, what is the effective resistance of the tube ?

Watch Video Solution

**11.** The current flowing through a conductor is 2 mA at 50 V and 3 mA at 60 v. Is it an ohmic or non-ohmic conductor ?

Watch Video Solution

**12.** A uniform wire is cut into 10 segments increasing in length in equal steps, the resitance of the shortest segment is R and the resistances of the other segments increase in steps of $8\Omega$. If the resistance of the longest segment is 2R, find the value of R and hence find the resistance of the original wire.

Watch Video Solution

**13.** 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 ?

Watch Video Solution

**14.** An are lamp operates at 80 V, 10 A. Suggest a method to use it with a 240 V d.c. source. Calculate the value of the electric component required for this purpose.

Watch Video Solution

**15.** Calculate the resistivity of a material of a wire 10 m long, 0.4 mm in diameter and having a resistance of $2.0\Omega$.

Watch Video Solution

**16.** The external diameter of a 5 metre long hollow tube is 10 cm and the thickness of its wall is 5 mm. If the specific resistance of copper be $1.7 \times 10^5$ ohm-metre, then determine its resistance.

Watch Video Solution

**17.** 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 $2\Omega$.

Watch Video Solution

**18.** What length of a copper wire of cross-sectional area $0.01mm^2$ would be required to obtain a resistance of $1k\Omega$? Resistivity of copper $= 1.7 \times 10^{-8}\Omega m$.

Watch Video Solution

**19.** A wire has a length of 2.0 m and a resistance of $5.0\Omega$. Find the electric field existing inside the wire if it carries a current of 10 A.

Watch Video Solution

**20.** A copper wire of radius 0.1 mm and resistance $1k\Omega$ is connected across a power supply of 20 V. (i) How many electrons are transferred per second between the supply and the wire at one end ? (ii) Write down the current density in the wire.

Watch Video Solution

**21.** Find the resistivity of eureka wire 1.1 m long and 0.2 mm in diameter. Resistivity of eureka $= 49 \times 10^{-8} \Omega$m. What is the current flowing through this wire when a potential difference of 2 V is applied across it ?

Watch Video Solution

**22.** A wire of resistance $10\Omega$ is drawn out so that its length is thrice its original length. Calculate its new resistance (resistivity and density of the material remain uncharged).

Or

A wire of resistance $10\Omega$ is drawn out so that its length is increased by twice its original length. Calculate its new resistance.

Watch Video Solution

**23.** A wire has a resistance of $16\Omega$. It is melted and drawn into a wire of half its length. Calculate the resistance of the new wire. What is the percentage change in its resistance ?

Watch Video Solution

**24.** Two wires of the same material having lengths in the ratio $1:2$ and diameters in the ratio $2:3$ are connected in series with an accumulator. Compute the ratio of P.D. across the two wires.

Watch Video Solution

**25.** Two wires A and B equal mass and of the same metal are taken. The diameter of the wire A is half the diameter of wire B. If the resistance of wire A is $24\Omega$, calculatate the resistance of wire B.

Watch Video Solution

**26.** A piece of silver ahs a resistance of $1\Omega$. What will be the resistance of a constantan wire of one-third length and one-half diameter, if the specific resistance of constantan is 30 times that of silver ?

Watch Video Solution

**27.** 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 prefered for overhead power cables ? Given $\rho Al = 2.63 \times 10^{-8} \Omega m \rho Cu = 0.72 \times 10^{-8} \Omega m$ , relative density of Al=2.7 and that of Cu =8.9.

Watch Video Solution

**28.** Two wires A and B are of same metal, have the same area of cross-section and have their lengths in the ratio $2:1$. What will be the ratio of currents flowing through them respectively when the same potential difference is applied across the length of each of them ?

Watch Video Solution

**29.** On applying the same potential difference between the ends of wires of iron and copper of the same length, the same current flows in them. Compare their radii. Specific resistances of iron and copper are respectively $1.0 \times 10^{-7}$ and $1.6 \times 10^{-8} \Omega m$. Can their current-densities be made equal by taking appropriate radii ?

Watch Video Solution

**30.** A wire of resistance $4\Omega$ is used to wind a coil of radius 7 cm. The wire has a diameter of 1.4 mm and the specific resistance of its material is $2 \times 10^{-7} \Omega m$. Find the number of turns in the coil.

Watch Video Solution

Watch Video Solution

**31.** A current of 5 ampere is passing through a metallic wire of cross-sectional area $4 \times 10^{-6} m^2$. If the density of the charge-carriers in the wire is $5 \times 10^{26} m^{-3}$, find the drift speed of the electrons.

Watch Video Solution

**32.** A copper wire has a resistance of $10\Omega$ and an area of cross-section $1mm^2$. A poetential difference of 10 V exists across the wire. Calculate the drift speed of electrons if the number of electrons per cubic metre in copper is $8 \times 10^{28}$ electrons.

Watch Video Solution

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

Watch Video Solution

**34.** Calculate 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 63.5. Take Avogadro's number $= 6.0 \times 10^{23}$.

Watch Video Solution

**35.** The resistivity of copper at room temperatrue is $1.7 \times 10^{-8} \Omega m$. If the free electron density of copper is $8.4 \times 10^{28} m^{-3}$, find the relaxation time for the free electrons of copper. Given $m_e = 9.11 \times 10^{-31} kg$ and $e = 1.6 \times 10^{-19} C$.

Watch Video Solution

**36.** An aluminium wire of diameter 0.24 cm is connected in series to a copper wire of diameter 0.16 cm. The wires carry an electric current of 10 ampere. Find (i) current-density in the aluminium wire (ii) drift velocity of electrons in the

copper wire. Given : Number of electrons per cubic metre volume of copper $= 8.4 \times 10^{28}$.

Watch Video Solution

**37.** Assuming that there is one free electron per atom in copper, determine the number of free electrons in $1\text{metre}^3$ volume of copper. Density of copper is $8.9 \times 10^3 kgm^{-3}$ and atomic weight 63.5. (Avogadro's number, $N = 6.02 \times 10^{26}$ per kg-atom).

Watch Video Solution

**38.** A current of 1.0 ampere is flowing through a copper wire of length 0.1 metre and cross-section $1.0 \times 10^{-6} m^2$. (i) If the

specific resistance of copper be $1.7 \times 10^{-8} \Omega m$, calculate the potential difference across the ends of the wire. (ii) Determine current density in the wire. (iii) If there be one free electron per atom in copper, then determine the drift velocity of electrons. Given : density of copper $= 8.9 \times 10^{3} kgm^{-3}$, atomic weight $= 63.5$, $N = 6.02 \times 10^{26}$ per kg-atom.

Watch Video Solution

**39.** A wire has a resistance of $2.1\Omega$ at 300 K and a resistance of $2.7\Omega$ at 373 K. Determine the temperature coefficent of resistance of the material.

Watch Video Solution

**40.** At room temperature $(27^{\circ}C)$, the resistance of a heating element is $100\Omega$. What is the temperature of the element if the resistance is found to be $117\Omega$, given that temperature coefficient of the resistor material is $1.70 \times 10^{-4}.^{\circ} C^{-1}$.

Watch Video Solution

**41.** (i) At what temperature would the resistance of a copper conductor be double its resistance at $0^{\circ}C$ ?

(ii) Does this temperature hold for all copper conductors regardles of shape and size ? Given $\alpha$ for Cu $= 3.9 \times 10^{-3}.^{\circ} C^{-1}$.

Watch Video Solution

**42.** A heating element using nichrome connected to a 230 V supply draws an 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 element if the room temperature is $27^{\circ}C$ ? Temperature coefficient of resistance of nichrome averaged over the temperature range involved is $1.70 \times 10^{-4} C^{-1}$.

Watch Video Solution

**43.** Resistance of tungsten wire at $150^{\circ}C$ is $133\Omega$. Its resistance temperature coefficient is $0.0045/^{\circ}C$. The resistance of this wire at $500^{\circ}C$ will be

Watch Video Solution

**44.** The rsistance of a conductor at $20^{\circ}C$ is $3.15\Omega$ and at $100^{\circ}C$ is $3.75\Omega$. Determine the temperature coefficient of resistance of the conductor. What will be the resistance of the conductor at $0^{\circ}C$ ?

Watch Video Solution

**45.** A standard coil marked $2\Omega$ is found to have a resistance of $2.118\Omega \text{ at } 30^{\circ}C$. Calculate the temperature at which the marking is correct. The temperature coefficient of the resistance of the material of the coil is $0.0042.^{\circ} C^{-1}$.

Watch Video Solution

**46.** A poetential difference of 200 V is applied to a coil at a temperature of $15^{\circ}C$ and the current is 10 A. What will be the mean temperature of the coil when the current hass fallen to 5 A, the applied voltage being same as before ? Given $\alpha = \frac{1}{234}.^{\circ} C^{-1}$ at $0^{\circ}C.$

Watch Video Solution

**47.** The resistances of an iron wire and a copper wire at $20^{\circ}C$are $3.9(\Omega)$and $4.1(\Omega)$respectively. At what temperature will the resistances be equal?Temperature coefficient of resistivity for iron is $5.0 \times 10^{-3}K^{-1}$and for copper it is $4.0 \times 10^{-3}k^{-1}$. Neglect any thermal expansion.

Watch Video Solution

**48.** The current through a conductor is 1 ampere when the temperature is $0^{\circ}C$ and 0.7 ampere when the temperature is $100^{\circ}C$. What would be current when the temperature of the conductor is $1200^{\circ}C$ ?

Watch Video Solution

**49.** A carbon filament has a resistance of $100\Omega \text{ at } 0^{\circ}C$. What must be the resistance of a copper filament placed in series with carbon so that the combination has the same resistance at all temperatures ? Temperature coefficient of resistance of carbon $= -0.0007.^{\circ}C^{-1}$ and that of copper is $0.004^{\circ}C^{-1}$.

Watch Video Solution

**50.** A metal wire of diameter 2 mm and length 100 m has a resistance of $0.5475\Omega$ at $20^\circ C$ and $0.805\Omega$ at $150^\circ C$. Find (i) the temperature of coefficient of resistance (ii) resistance at $0^\circ C$ (iii) resistivities at $0^\circ$ and $20^\circ C$.

Watch Video Solution

**51.** Given the resistance of $1\Omega$, $2\Omega$, $3\Omega$, how will you combine them to get an e3quivalent resistance of :

$\frac{11}{3}\Omega \quad (ii)\frac{11}{5}\Omega \quad (iii)6\Omega \quad \frac{6}{11}\Omega$ ?

Watch Video Solution

**52.** Given n resistors each of resistane 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 ?

Watch Video Solution

**53.** Two square metal plates A and B are of same thickness and material. The side of B is twice that of A. These are connected in series, as shown in Fi. 4.3. Find the ratio $R_A / R_B$ of the resistance of the two plates.

Watch Video Solution

**54.** Three conductors of conductances $G_1, G_2$ and $G_3$ are connected in series. Find their equivalent conductance.

Watch Video Solution

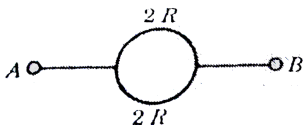
**55.** A set of n identical resistors, each of resistance $R\Omega$, when connected in series have an effective resistance $X\Omega$ and when the resistors are connected in parallel, their effective resistance is $Y\Omega$. Find the relation between R, X and Y.

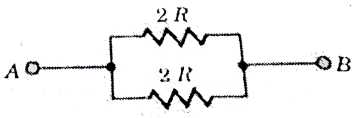
Watch Video Solution

**56.** A parallel combination of three resistors takes a current of 7.5 A from a 30 V supply. If the two resistors are $10\Omega \text{ and } 12\Omega$, find the third one.

Watch Video Solution

**57.** A wire of resistance 4 R is bent in the form of a circle [Fig 4.4]. What is the effective resistance between the ends of the diameter ?




Watch Video Solution

**58.** The resistance of two conductors in series is $40\Omega$ and their resistance becomes $7.5\Omega$, when coneected in parallel. Find the resistance of the individual conductors.

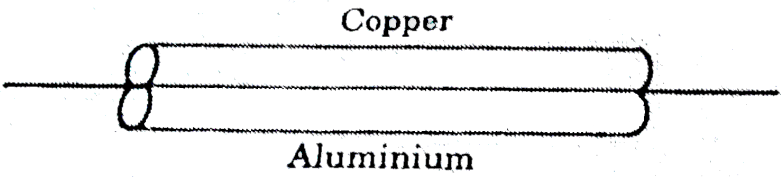
Watch Video Solution

**59.** A wire of uniform cross-section and length $l$ has a resistance of $16\Omega$ 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

Watch Video Solution

**60.** A copper rod of length 20 cm and cross-sectional area $2mm^2$ is joined with a similar aluminium rod as shown in Fig. 4.6. Find the resistance of the combination between the ends. Resistivity of copper $= 1.7 \times 10^{-8}\Omega$m and resistivity

of aluminium $= 2.6 \times 10^{-8} \Omega$m.




Watch Video Solution

**61.** Find the value of current I in the circuit

Watch Video Solution

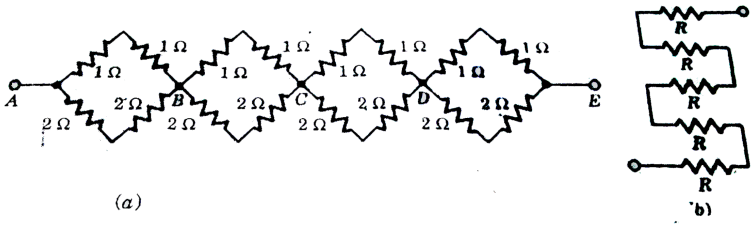
**62.** A letter A consists of a uniform wire of resistance 1 ohm per cm. The sides of the letter are each 20 cm long and the cross-piece in the middle is 10 cm long while the apex angle is $60^{\circ}$. Find the resistance of the letter between the two ends of the legs.

Watch Video Solution

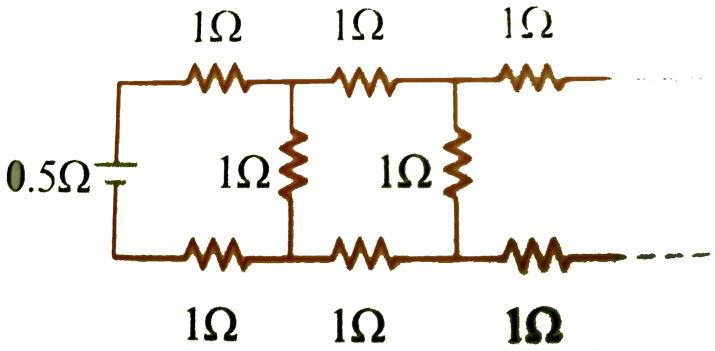
**63.** Determine the voltage drop across the resistor $R_1$ in the circuit given below with $E = 60V$, $R_1 = 18\Omega$, $R_2 = 10\Omega$.

Watch Video Solution

**64.** Determine the equivalent resistance of the following networks :




Watch Video Solution




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

Watch Video Solution

**66.** Find the effective resistance between points A and B for the network

Watch Video Solution

**67.** Find the effective resistance of the network shown in Fig.4.15 between the points A and B when (i) the switch S is open (ii) switch S is closed.

Watch Video Solution

**68.** Find the equivalent resistance between the points A and B of the network of resistors shown in Fig. 4.16.

Watch Video Solution

**69.** Find the effective resistance between points A and B of the network of resistors

Watch Video Solution

**70.** In the circuit shown in Fig. 4.19. $R_1 = 100\Omega, R_2 = R_3 = 50\Omega, R_4 = 75\Omega$ and E=4.75 V. Work out the equivalent resistance of the circuit and the current in each resistor.

Watch Video Solution

**71.** In the circuit shown in Fig.4.20 both the ammeter and the cell have negligible resistance. Three external resistors are identical. When the switch S is opened, the ammeter reads 0.6 A. What will the ammeter read when the switch S is closed ?

Watch Video Solution

**72.** For driving a current of 3 A for 5 minutes is an electric circuit, 900 J of work is to be done. Find the emf of the source in the circuit.

Watch Video Solution

**73.** A voltmeter of resistance $998\Omega$ is connected across a cell of emf 2 V and internal resistance $2\Omega$. Find the p.d. across the voltmeter, that across the terminals of the cell and percentage error in the reading of the voltmeter.

Watch Video Solution

**74.** A secondary cell after long use has an emf of 1.9 V and a large internal resistance of $380\Omega$. What maximum current

can be drawn from the cell ? Could the cell drive the starting motor of a car ?

Watch Video Solution

**75.** A battery of emf 10 v and internal resistane $3\Omega$ 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 ?

Watch Video Solution

**76.** In the circuit shown in Fig. 4.25, the voltmeter reads 1.5 V, when the key is open. When the key is closed, the voltmeter

reads 1.35 V and ammeter reads 1.5 A. Find the emf and the internal resistance of the cell.

Watch Video Solution

**77.** A battery of emf 3 volt and internal resistance r is connected in series with a resistor of $55\Omega$ through an ammeter of resistance $1\Omega$. The ammeter reads 50 mA. Draw the circuit diagram and calculate the value of r.

Watch Video Solution

**78.** The reading on a high resistance voltmeter when a cell is connected across it is 2.2 V. When the terminals of the cell are also connected to a resistance of $5\Omega$, the voltmeter

reading drops to 1.8 V. Find the internal resistance of the cell.

Watch Video Solution

**79.** The emf of a battery is 6 V and its internal resistance is $0.6\Omega$. A wire of resistance $2.4\Omega$ is connected to the two ends of the battery, calculate (a) current in the circuit and (b) the potential difference between the two terminals of the battery in closed circuit.

Watch Video Solution

**80.** A battery supplies a current of 0.9 A through a $2\Omega$ resistor and a current of 0.3 A through a $7\Omega$ resistor.

Calculate the emf and internal resistance of the battery.

Watch Video Solution

**81.** A battery of emf 2.0 volts and internal resistance $0.10(\Omega)$ is being charged with a current of 5.0A. What is the potential difference between the terminals of the battery?

Watch Video Solution

**82.** A battery of emf 12.0 V and internal resistance $0.5\Omega$ is to be charged by a battery charger which supplies 110 V d.c. How much resistance must be connected in series with the battery to limit the charging current to 5.0 A ? What will be

the p.d. across the terminals of the battery during charging ?

Watch Video Solution

**83.** (a)A car has a fresh storage battery of emf $12V$ 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?

(b) After long use, the internal resistance of the storage battery increase to $500\Omega$. What maximum current can be drawn from the battery? Assume the emf of the battery to remain unchanged.

(c) If the discharged battery is charged by an external emf source, is the terminal voltage of the battery during charging greater or less than its emf $12V$?

Watch Video Solution

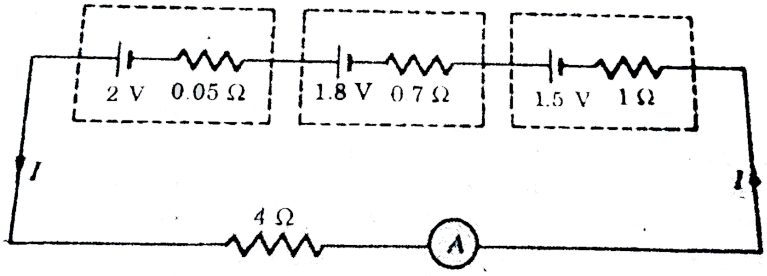
**84.** Six lead-acid type of secondary cells each of emf $2.0$ V and internal resistance $0.015\Omega$ are jouned in series to provide a supply to a resistance of $8.5\Omega$. What are the current drawn from the supply and its terminal voltage ?

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

Watch Video Solution

**85.** Three cells of emf 2.0 v, 1.8 V and 1.5 V are connected in series. Their internal resistances are $0.05\Omega, 0.7\Omega \text{ and } 1\Omega$

respectively. If the battery is connected to an external resistor of $4\Omega$ via a very resistance ammeter, what would be the reading in the ammeter ?




Watch Video Solution

**86.** A cell of emf $1.1V$ and internal resistance $0.5\Omega$ is connected to a wire of resistance $0.5\Omega$. 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

Watch Video Solution

**87.** Two identical cells of emf 1.5 V each joined in paralllel provide supply to an external circuit consisting of two resistances of $17\Omega$ each joined in parallel. A very high resistance voltmeter reads the terminal voltage of cells to be 1.4 V. Calculate the internal resistance of each cell.

Watch Video Solution

**88.** Two cells $E_1$ and $E_2$ of emfs 4 V and 8 V having internal resistances $0.5\Omega$ and $1.0\Omega$ respectively are connected in opposition to each other. This combination is connected in series with resistances of $4.5\Omega$ and $3.0\Omega$. Another resistance is connected in parallel across the $3\Omega$ resistor.

(a) Draw the circuit diagram

(b) Calculate the total current flowing through the circuit.

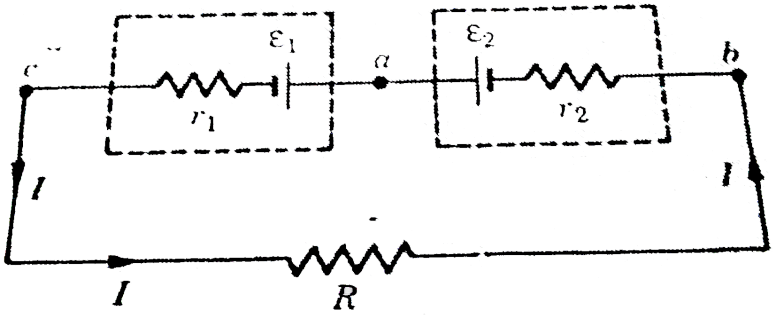
Watch Video Solution

**89.** In the circuit diagram given in Fig. 4.31, the cells $E_1$ and $E_2$ have emf's 4 V and 8 V and internal resistances $0.5\Omega$ and $10\Omega$ respectively. Calculate the current in each resistance .

Watch Video Solution

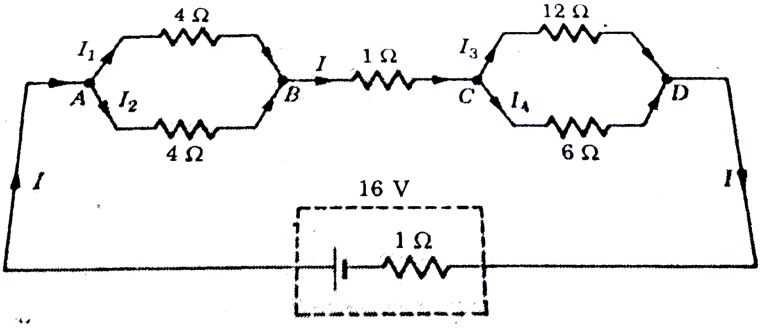
**90.** In Fig. 4.32 $\varepsilon_1$ and $\varepsilon_2$ are respectively 2.0 V and 4.0 V the resistances $r_1, r_2$ and R are respectively $1.0\Omega, 2.0\Omega$ and $5.0\Omega$. Calculate the current in the circuit. Also calculate (i) potential difference between the points b

and a, (ii) potential difference between a and c.




Watch Video Solution

**91.** A network of resistances is connected to a 16 V battery with internal resistance of $1\Omega$, as shown in Fig. 4.33.




(a) Compute epuivalent resistance of the network,

(b) obtain the current In in each resistor, and

(c ) obtain the voltage drops $V_{AB}, V_{BC}$ and $V_{CD}$.

Watch Video Solution

**92.** A galvanometer together with an unkonwn resistance in series is connected across two identical cells, each of emf 1.5 V. When the cells are connected inseries, the galvanometer records a current of 1 A and when the cells are connected in parallel, the current =0.6 A. What is the internal resistance of each cell ?

Watch Video Solution

**93.** A cell of emf 1.5 V and internal resistance $0.5\Omega$ is connected to a (non-linear) conductor whose V-I graph is shown in Fig. 4.36 (a). Obtain graphically the current drawn from the cell and its terminal voltage.

Watch Video Solution

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

Watch Video Solution

**95.** Three cells each of emf 1.5 V, after being connected in series with each other, are connected to the ends of a resistance. The current obtained is 1 A. When the cells are connected in parallel across the ends of the same resistance, the current is found to be 0.36 A. Find the external resistance and the internal resistance of each cell.

Watch Video Solution

**96.** The ends of a resistance are connected to 19 cells in series, each of resistance $0.1\Omega$. The current is found to be 2 A. The number of cells is reduced to 15 and an extra resistance of $9.5\Omega$ is connected in series to the given resistance. The current becomes one-half. Find the given resistance and emf of each cell.

Watch Video Solution

## Problems From Competitive

**1.** The resistance of a wire is R ohm. What will be its new resistance if it is stretched to n times its original length ?

Watch Video Solution

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

Watch Video Solution

**3.** A uniform copper wire of mass $2.23 \times 10^{-3}$ kg carries a current of 1 A when 1.7 V is applied across it. Calculate its length and area of cross-section. If the wire is uniformly stretched to double its length, calculate the new resistance. Density of copper is $8.92 \times 10^{3} kgm^{-3}$ and resistivity is $1.7 \times 10^{-8} \Omega$ m.

Watch Video Solution

**4.** One metre long metallic wire is broken into two unequal parts P and Q. The part P is uniformly extended into another wire R. Find the ratio of the resistances of P and R and also the ratio of the lengths P and Q.

Watch Video Solution

**5.** 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:

Watch Video Solution

**6.** The lengths and radii of three wires of same metal are in the ratios $2:3:4$ and $3:4:5$ respectively. They are joined in parallel and included in a circuit having 5 A current. Find current in each wire.

Watch Video Solution

**7.** Find in the given network of resistors, the equivalent resistance between the points A and B, between A and D, and between A and C.

Watch Video Solution

**8.** A cell of emf $3.4V$ and internal resistance $3\Omega$ is connected to an ammeter having resistance $2\Omega$ and to an external resistance of $100\Omega$. When a voltmeter is connected across the $100\Omega$ resistance, the ammeter reading is $0.04A$. Find the voltage reading by the voltmeter and its resistance. Had the voltmeter been an ideal one what would have been its reading?

Watch Video Solution

**9.** A battery of emf $E$ is connected with there resistance $R, 2R$ and $3R$ in series. The voltage across $2R$ is measured with a voltmeter whose resistance a $10R$ .What is the percentage error ?

Watch Video Solution

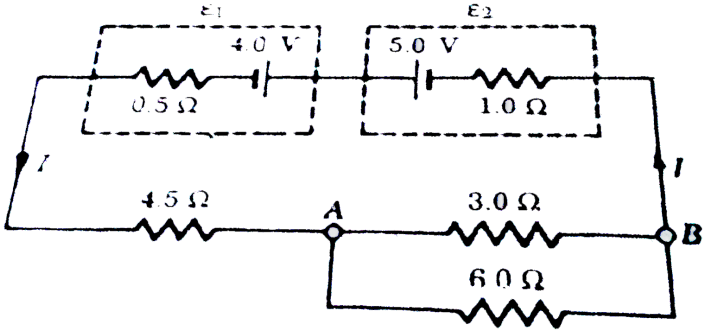
**10.** Two resistance of $400\Omega$ and $800\Omega$ are connected in series with 6 volt battery of negligible internal resistance. A voltmeter of resistance $10,000\Omega$ is used to measure the potential difference across $400\Omega$. The error in measurement of potential difference in volts approximatley is

Watch Video Solution

**11.** 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 ?

Watch Video Solution

**12.** In the circuit shown in Fig. 4.41, calculate the current in each resistor and potential difference across each resistor.




Watch Video Solution

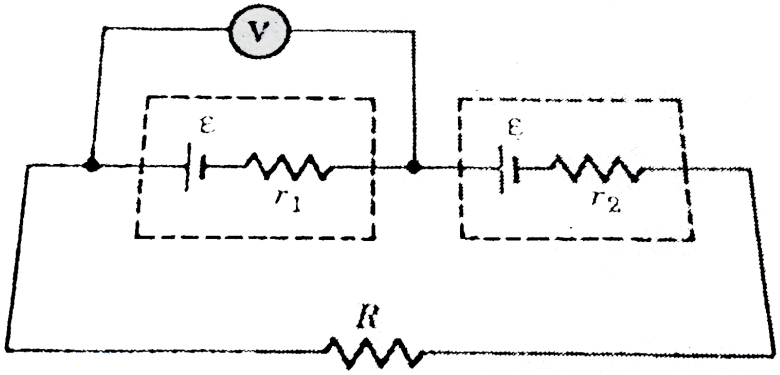
**13.** Calculate the steady-state current through $2\Omega$ resistor in the circuit shown in Fig. 4.42. The internal resistance of the battery is negligible and $C = 2\mu F$.

Watch Video Solution

**14.** Five $4\Omega$ resistances, a 2 V battery and an ammeter are connected s shown in Fig. 4.43. Find the ammeter reading.

Watch Video Solution

**15.** Two cells of same emf $\varepsilon$, but different internal resistances $r_1$ and $r_2$ are connected to an external resistance R, as shown. The voltmeter V reads zero. Find R in terms of $r_1$ and $r_2$, and the voltage across the cell of internal resistance $r_2$.




Watch Video Solution

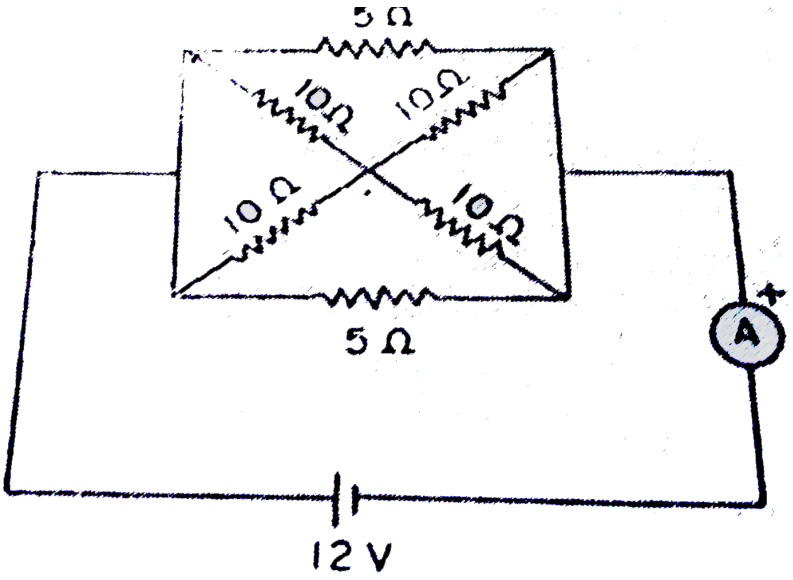
**16.** Find the emf $\varepsilon$ and the internal resistance r of an electric source which is equivalent to two batteries of emf's $\varepsilon_1$ and $\varepsilon_2$ and internal resistances $r_1$ and $r_2$, connected in parallel.

Watch Video Solution

**17.** (i) What value of $R_1$ in the given network will make the equivalent resistance between A and B equal to $R_0$ ? (ii) If the cell between A and B be shifted to between C and D, what be the equivalent resistance between C and D ?

Watch Video Solution

**18.** Calculate the current shown by the ammeter A in the circuit shown in Fig. 4.47.




Watch Video Solution

Problems For Self

**1.** One billion electrons pass from a point P towards another point Q in $10^{-3}$ s. What is the current in ampere ? What is its direction ?

Watch Video Solution

**2.** Calculate the number of free electrons passing through the filament of an electric lamp in one hour when the current through the filament is 0.32 A.

Watch Video Solution

**3.** In the electrolysis of silver chloride, a charge of $4 \times 10^5$ C is flowing through the electrolyte. Calculate the number of silver $\left(Ag^+\right)$ ions flowing through it.

Watch Video Solution

**4.** In a hydrogen atom, the electron makes about $0.6 \times 10^{16}$ revolutions per second around the nucleus. Determine the average current at any point on the orbit of the electron.

Watch Video Solution

**5.** An electron gun emits $2.0 \times 10^{16}$ electrons per second. What is the associated current ?

Watch Video Solution

**6.** An electric current of $2.0\mu A$ exists in a discharge tube. How much charge flows across a cross-section of the tube in 5 minutes ?

Watch Video Solution

**7.** An electron moves in a circular orbit of radius 10 cm with a constant speed of $4.0 \times 10^6 ms^{-1}$. Determine the electric current at a point on the orbit.

Watch Video Solution

**8.** The current through a wire depends on time as $I = I_0 + \alpha t$, where $I_0 = 10$ A and $\alpha = 4As^{-1}$. Find the charge that flows across a section of the wire in 10 seconds.

Watch Video Solution

**9.** A current of 4.8 A is flowing in a copper wire of cross-sectional area $3 \times 10^{-4} m^2$. Find the current density in the wire.

Watch Video Solution

**10.** A voltage of 30 V is applied across a colour coded carbon resistor with first, second and third rings of blue, black and yellow colurs. What is the current flowing through the resistor ?

Watch Video Solution

**11.** The sequence of bands marked on a carbon resistor is yellow , red orange and silver. What is its (a) resistance and (b) tolerance ?

Watch Video Solution

**12.** The resistance of a conductivity wire of length 1.1 m and of diameter 0.14 mm is $30\Omega$. Calculate its resistivity.

Watch Video Solution

**13.** A metal wire of specific resistance $64 \times 10^{-6}\Omega$ m and length 1.98 cm has a resistance of $7\Omega$. Find its radius.

Watch Video Solution

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

Watch Video Solution

**15.** Calculate the resistance of a 2 m long nichrome wire of radius 0.321 mm. Resistivity of nichrome is $15 \times 10^{-6}\Omega$ m. If a potential difference of 10 V is applied across this wire, what will be the current in the wire ?

Watch Video Solution

**16.** Find the resistance of a hollow cylindrical conductor of length 1.0m and inner and outer radii 1.0mm and 2.0mm respectively. The resistivity of the material is $2.0 \times 10^{-8}(\Omega)m$.

Watch Video Solution

**17.** Calculate the electric field in a copper wire of cross-sectional area $2.0mm^2$ carrying a current of 1 A. The resistivity of copper $= 1.7 \times 10^{-8}\Omega$m.

Watch Video Solution

**18.** A given copper wire of resistance R is stretched to reduce its diameter to half its previous value. What sould be its new

resistance ?

Watch Video Solution

**19.** What will be the change in resistance of a constantan wire when its radius is made half and length reduced to one-fourth of its original length ?

Watch Video Solution

**20.** A wire of resistance $10\Omega$ is drawn out so that its length is thrice its original length. Calculate its new resistance (resistivity and density of the material remain uncharged).

Watch Video Solution

**21.** A metallic wire of length 1 m is stretched to duble its length. Calculate the ratio of its initial and final resistances assuming that there is no change in its density on stretching.

Watch Video Solution

**22.** A cylindrical wire is stretched to increase its length by 10%. Calculate the percentage increase in resistance.

Watch Video Solution

**23.** Two copper wires A and B of equal masses are taken. The length of A is double the length of B. If the resistance of wire A is $160\Omega$, then calculate the resistance of the wire B.

Watch Video Solution

**24.** $1kg$ piece of copper is drawn into a wire $1mm$ thick and another piece into a wire $2mm$ thick. Compare the resistance of these wires.

Watch Video Solution

**25.** A rheostat has 100 turns of a wire of radius 0.4 mm having resistivity $4.2 \times 10^{-7}\Omega$m. The diameter of each turn is 3 cm. What is the maximum value of resistance that it can introduce ?

Watch Video Solution

**26.** Calculate the conductivity of a wire of length 2 m, area of cross-sectionl $2cm^2$ and resistance $10^{-4}\Omega$.

Watch Video Solution

**27.** What length of a wire of diameter 0.46 mm and specific resistance $50 \times 10^{-6}\Omega$m would be required to make a coil of resistance $10\Omega$ ?

Watch Video Solution

**28.** The size of a carbon block is $1.0 \times 10cm \times 50cm$. Find its resistance (i) between the opposite square faces (ii) between the opposite rectangular faces of the block. The resistivity of carbon is $3.5 \times 10^{-5}\Omega cm$.

Watch Video Solution

**29.** Given that resistivity of copper is $1.68 \times 10^{-8} \Omega$m. Calculate the amount of copper required to draw a wire 10 km long having resistance of $10\Omega$. The density of copper is $8.9 \times 10^{3} kgm^{-3}$.

Watch Video Solution

**30.** A potential difference of 10 V is applied across a conductor of resistance $1k\Omega$. Find the number of electrons flowing through the conductor in 5 minutes.

Watch Video Solution

**31.** A wire of resistance $48\Omega$ is uniformly stretched until its new length becomes 4 times the original length. Find its new resistance.

Watch Video Solution

**32.** Two wires A and B of the same material have their lengths in the ratio $1:5$ and diameters in the ratio $3:2$. If the resistance of the wire B is $180\Omega$, find the resistance of the wire A.

Watch Video Solution

**33.** Two wires of the same material have resistances in the ratio $16:81$ and lengths in the ratio $1:4$. Compare their radii

of cross-section.

Watch Video Solution

**34.** Two wires of different materials have resistances in the ratio $4:3$, lengths in the ratio $2:1$ but have same radii of cross-section. Compare their resistivities.

Watch Video Solution

**35.** 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 $4\Omega$, find the resistance of the original wire.

Watch Video Solution

**36.** The free electrons of a copper wire of cross-sectional area $10^{-6}m^2$ acquire a drift velocity of $10^{-4}m/s$ when a certain potential difference is applied across the wire. Find the current flowing in the wire if the density of free electrons in copper is $8.5 \times 10^{28}\text{electrons}/m^3$.

Watch Video Solution

**37.** What is the drift velocity of electrons in a copper conductor having a cross-sectional area of $5 \times 10^{-6}m^2$ if the current is 10 A. Assume there are $8.0 \times 10^{28}\text{electrons}/m^3$.

Watch Video Solution

**38.** Calculate the drift velocity for the electrons in a silver wire which has a radius of 0.1 cm and carries a current of 2 A. Atomic mass of silver=108 and density of silver $= 10.5 \times 10^3 kg/m^3$.

Watch Video Solution

**39.** A current of 2 A is flowing through a wire of length 4 m and cross-sectional area $1mm^2$. If each cubic metre of the wire contains $10^{29}$ free electrons, find the average time taken by an electron to cross the length of the wire.

Watch Video Solution

**40.** A 10 C of charge flows through a wire in 5 minutes. The radius of the wire is 1 mm. It contains $5 \times 10^{22}$ electrons per $\text{centimetre}^3$. Calculate the current and drift velocity.

Watch Video Solution

**41.** A copper wire of diameter 0.16 cm is connected in series to an aluminium wire of diameter 0.25 cm. A current of 10 A is passed through them. Find (i) current density in the copper wire (ii) drift velocity of free electrons in the aluminium wire. The number of free electrons per unit volume of aluminium wire is $10^{29} m^{-3}$.

Watch Video Solution

**42.** A current of 30 ampere is flowing through a wire of cross-sectional area $2mm^2$. Calculate the drit velocity of electrons. Assuming the temperature of the wire to be $27^\circ C$ , also calculate the rms velocity at this temperature. Which velocity is larger ? Given that Boltzman's constant $= 1.38 \times 10^{-23} JK^{-1}$, density of copper $8.9gcm^{-3}$, atomic mass of copper =63.

Watch Video Solution

**43.** What is the drift velcity of electrons in silver wire of length 1 m having cross-sectional area $3.14 \times 10^{-6} m^2$ and carrying a current of 10 A . Given atomic mass of silver =108, density of silver $= 10.5 \times 10^3 kgm^{-3}$, charge on electron $= 1.6 \times 10^{-19} C$ and Avogadro's number $= 6.023 \times 10^{26}$ per kt-atom.

Watch Video Solution

**44.** Find the time of relaxation between collsion and free path of electrons in copper at room temperature. Given resistivity of copper $= 1.7 \times 10^{-8} \Omega$m, number density of electrons in copper $= 8.5 \times 10^{28} m^{-3}$, charge on electron $= 1.6 \times 10^{-19}$ C, mass of electron $= 9.1 \times 10^{-3}$ kg and drift velocity of free electrons $= 1.6 \times 10^{-4} ms^{-1}$

View Text Solution

**45.** A plantinum wire has resistance of $10\Omega$ at $0^\circ C$ and $20\Omega$ at $273^\circ C$. Find the value of coefficient of resistance.

Watch Video Solution

**46.** A platinum resistance thermometer makes use of the variation of a conductor with temperature. If the resistance of this thermometer is $5\Omega$ at $20^\circ C$ and $16\Omega$ when inserted in a furnace, find the temperature of the furnace. Given $\alpha$ for the platinum $= 0.0036^\circ C$.

View Text Solution

**47.** The temperature coefficent of resistance of a wire is 0.00125 per $.^\circ C$, At 300 K, its resistance is $1\Omega$. At what temperature will its resistance become $2\Omega$ ?

View Text Solution

**48.** An electric toaster uses nichrome for its heating element. When a negligibly small current passes through it. It resistance at room temperature $(27.0^{\circ}C)$ is found to be $75.3\Omega$. When the toaster is connected to a $230V$ supply, the current settles, after a few seconds, to a steady value of $2.68A$. What is steady temperature of the nichrome element? The temperature coefficient of resistance of nichrome averaged over the temperature range involved , $1.70 \times 10^{-4}C^{-1}$

Watch Video Solution

**49.** A nichrome heating element connected to a 200 V supply draws an intial current of 2.2 A which settles down after a few seconds to a steady value of 2.0 A. Find the steady

temperature of the heating element. The room temperature is $30^{\circ}C$ and the average temperature coefficient of resistance of nichrome is $1.7 \times 10^{-4} \text{per}^{\circ}C$.

View Text Solution

**50.** A standard coil marked $3\Omega$ is found to have a true resistance of $3.115\Omega$ at 300 K. Calculate the temperature at which marking is correct. Temperature coefficient of resistance of the material of the coil is $4.2 \times 10^{-3}.^{\circ} C^{-1}$.

View Text Solution

**51.** The resistance of a silver wire at $0^{\circ}C$ is $1.25\Omega$. Upto what temperature it must be heated so that its resistance is

doubled ? The temperature coefficient of resistance of silver is $0.00375^{\circ}C^{-1}$. Will the temperature be same for all silver conductors of all shapes ?

Watch Video Solution

**52.** The resistance of a coil used in a platinum-resistance thermometer at $0^{\circ}C$ is $3.00\Omega$ and at $100^{\circ}C$ is $3.75\Omega$. Its resistance at an unkown temperature is measured as $3.15\Omega$. Calculate the unknown temperature.

View Text Solution

**53.** The temperature coefficient of a resistance wire is $0.0012^{\circ}C^{-1}$. At 300 K, its resistance is $1\Omega$. At what

temperature the resistance of the wire will be $2\Omega$ ?

Watch Video Solution

**54.** The temperature coefficient of copper is $0.004^{\circ}C^{-1}$. Find the resistance of a 5 m long copper wire of diameter 0.2 mm at $100^{\circ}C$, if the resistivity of copper at $0^{\circ}C$ is $1.7 \times 10^{-8}\Omega$ m.

View Text Solution

**55.** Three resistors of $1\Omega, 2\Omega$ and $3\Omega$ are combined in series. (i) What is the total resistance of the combination ? (ii) If the combination is connected to a battery of emf 12 V

and negligible internal resistance, obtain the potential dropo across each resistor.

Watch Video Solution

**56.** (i) Three resistors $2\Omega, 4\Omega$ and $5\Omega$ are comined in parallel. What is the total resistance of the combination ? (ii) If the comnbination is connected to a battery of 20 V and negligible internal resistance, determine the current through each resistor, and the total current drawn.

View Text Solution

**57.** How can the resistances of $2\Omega, 3\Omega$ and $6\Omega$ be connected to give an effective resistance of $4\Omega$ ?

View Text Solution

**58.** Given three resistances of $30\Omega$ each. How can they be connected to given a total resistance of (i) $90\Omega (ii) 10\Omega (iii) 45\Omega$ ?

View Text Solution

**59.** A $5\Omega$ resistor is connected in series with a parallel combination of n resistors of $6\Omega$ each. The equivalent resistance is $7\Omega$. Find n.

View Text Solution

**60.** A uniform wire which connected in parallel with the 2 m long wire, will give a resistance of $2.0\Omega$.

View Text Solution

**61.** The resistance of two conductors in series is $18\Omega$ and the resistance becomes $4\Omega$ when connected in parallel. Find the resistance of individual conductors.

View Text Solution

**62.** A wire whose resistance is 90 ohm is cut into 3 pieces of equal lengths which are then arranged in parallel. Calculate the resistance of the combination.

View Text Solution

**63.** When a current of 0.5 A is passed through two resistances in series, the potential difference between the ends of the series arrangement is 12.5 V. On connecting them in parallel and passing a current of 1.5 A, the potential difference between their ends is 6 V. Calculate the two resistances.

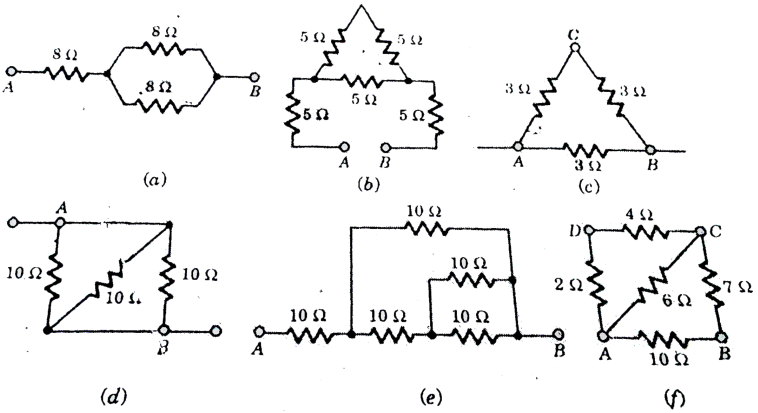
View Text Solution

**64.** Two wires a and b, each of length 40 m and area of cross-section $10^{-7}m^2$ , are connected in series and a potenital difference of 60 V is applied between the ends of this combined wire. Their resistances are respectively 40 and $20\Omega$

. Determine for each wire (i) specific resistance, (ii) electric-field and (iii) current-dentsity.

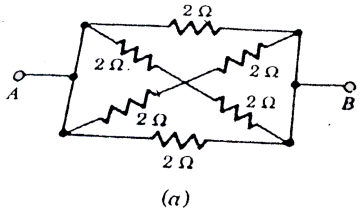
View Text Solution

**65.** Calculate the equivalent resistance between points A and B in each of the following networks of resistors :

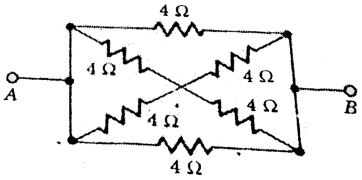



View Text Solution

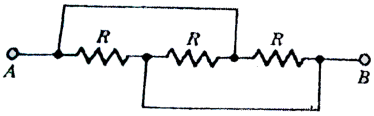
**66.** Calculate the resistance between points A and B for the following networks :



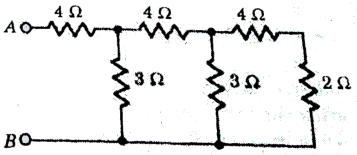
(a)



(b)



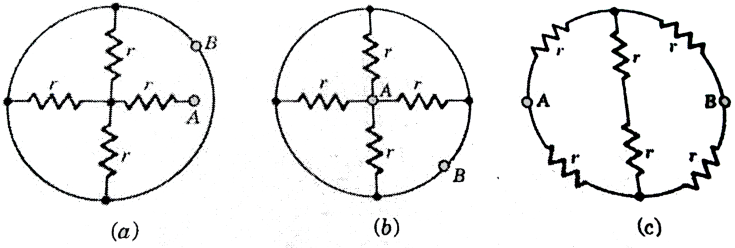
(c)



(d)

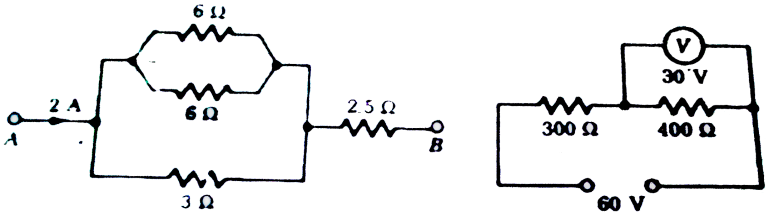
View Text Solution

**67.** Find the equivalent resistance of the networks shown in Fig. 4.51 between the points A and B.




View Text Solution

**68.** Find the potential difference between the points A and B for the network shown in Fig. 4.52.

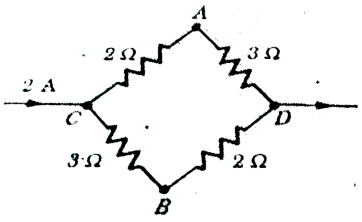


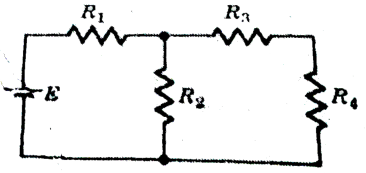

View Text Solution

**69.** In the circuit diagram shown in Fig. 4.53, a voltmeter reads 30 V when connected across $400\Omega$ resistance. Calculate what the same voltmeter reads when it is connected across $300\Omega$ resistance.

View Text Solution

**70.** Find the potential difference between points A and B $(V_B - V_A)$ in the network



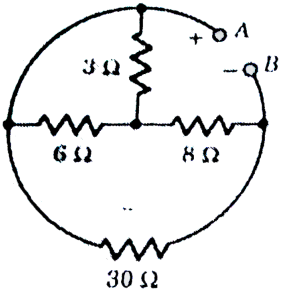



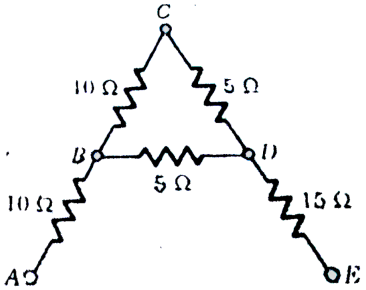

View Text Solution

**71.** Determine the voltage drop across the resistance $R_1$ in the circuit given in Fig. 4.55 with $\varepsilon = 90V, R_1 = 5k\Omega, R_2 = 5k\Omega, R_3 = 10k\Omega$ and $R_4 = 10k\Omega$ .

View Text Solution

**72.** Find the equivent resistance between points A and B



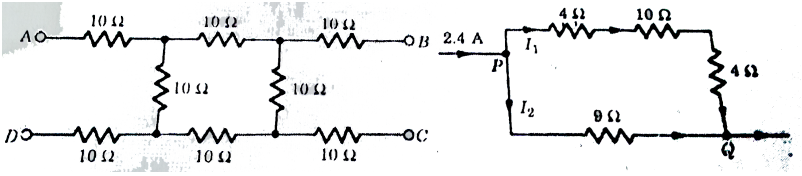




Watch Video Solution

**73.** Letter A as shown in Fig. 4.57 has resistance on each side of arm. Calculate the total resistance between two ends of the legs.

Watch Video Solution

**74.** Find the resistance between the points (i) A and B and (ii) A and C of the network

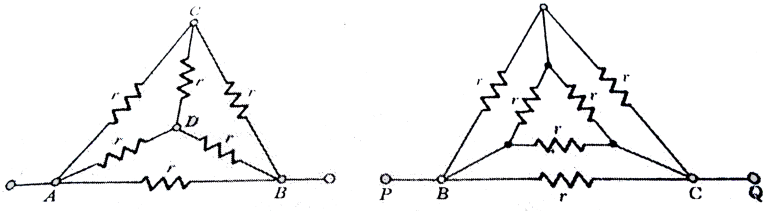



Watch Video Solution

**75.** A combination of four resistances is shown in Fig. 4.59. Calculate the potential difference between the points P and Q, and the values of currents flowing in the different resistances.

Watch Video Solution

**76.** Find the equivalent resistance of the circuit shown in Fig.4.60 between the points A and B. Each resistor has a resistance r.

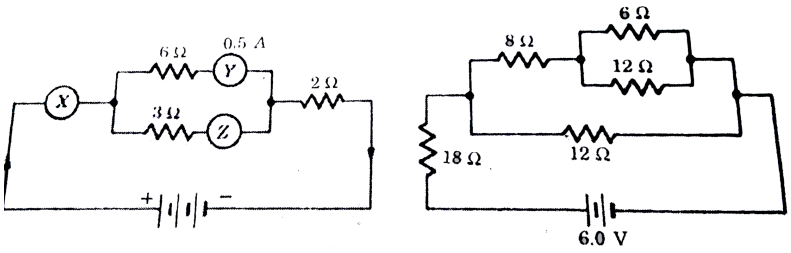



Watch Video Solution

**77.** Find the equivealent resistance of the circuit shown in Fig. 4.61 between the points P and Q. Each resistor has a resistance r.

Watch Video Solution

**78.**



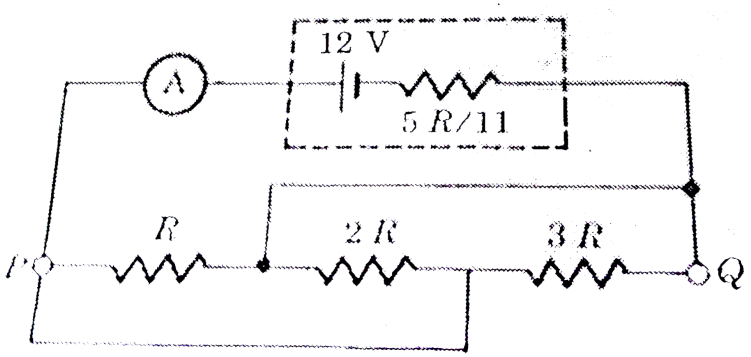

X, Y and Z are ammeters and Y reads 0.5 A. (i) What are the readings in ammeters X and Z ? (ii) What is the total resistance of the circuit ?

Watch Video Solution

**79.** In the circuit shown in Fig. 4.63, the terminal voltage of the battery is 6.0 V. Find the current I through the $18\Omega$ resistor.

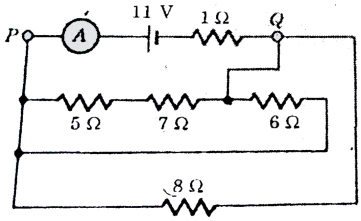
View Text Solution

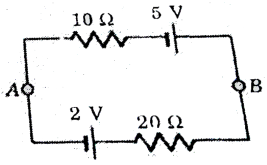
**80.** In the circuit shown in Fig. 4.64, the battery has an emf of 12.0 V and an internal resistance of $5R/11$. If the ammeter reads 2.0 A, what is the value of R ?




View Text Solution

**81.** Find the ammeter reading in the cirucit shown in Fig. 4.65.




View Text Solution

**82.** Find the potential difference between the points A and B in the circuit shown in Fig. 4.66. Internal resistances of the cells are negligible.

View Text Solution

**83.** The reading of a voltmoter when a cell is connected to it is 2.2 V. When the terminals of the cell are connected to a resistance of $4\Omega$, the voltmeter reading drops to 2 V. Find the internal resistance of the cell.

View Text Solution

**84.** The potential difference across a cell is 1.8 V when a current of 0.5 A is drawn from it. The p.d. falls to 1.6 V when a current of 1.0 A is drawn. Find the emf and the internal resistance of the cell.

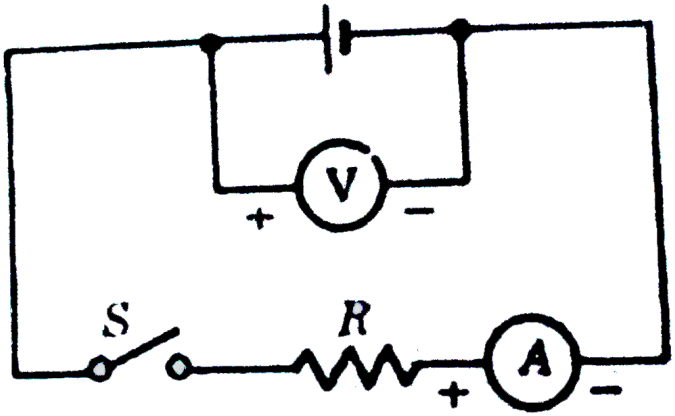
Watch Video Solution

**85.** The potential difference of a cell in an open circuit is 6 V, which falls to 4 V when a current of 2 A is drawn from the cell. Calculate the emf and the internal resistance of the cell.

View Text Solution

**86.** In the circuit shown in Fig. 4.67, the resistance of the ammeter A is negligible and that of thevoltmeter V is very high. When the switch S is open, the reading of voltmeter is 1.53 V. On closing the switch S, the reading of ammeter drops to 1.03 V. Calculate : (i) emf of the cell (ii) internal resistance

of the cell (iii) value of R.




View Text Solution

**87.** The potential differnce between the terminals of a battery of emf 6.0 V and internal resistance $1\Omega$ drops to 5.8 V when connected across an external resistor . Find the resistance of the external res

View Text Solution

**88.** The potenital difference between the terminals of a 6.0 V battery is 7.2 V when it is being charged by a current of 2.0 A. What is the internal resistance of the resistor.

View Text Solution

**89.** A battery of emf 2 V and internal resistance $0.5\Omega$ is connected across a resistance of $9.5\Omega$. How many electrons pass through a cross-section of the resistance in 1 second ?

View Text Solution

**90.** When a resistance of $2\Omega$ is placed across the terminals of a battery, the current is 0.5 A. When the resistance across the terminals of the battery is $5\Omega$, the current is 0.25 A.

Calculate the emf of the battery and also its internal resistance.

View Text Solution

**91.** The emf of a battery is 4.0 V and its internal resistance is $1.5\Omega$. Its potential difference is measured by a voltmeter of resistance $1000\Omega$. Calculate the percentage error in the reading of emf shown by voltmeter.

Watch Video Solution

**92.** 10 cells, each of internal resistance $0.5\Omega$ and 1.2 V emf are connected (a) all in series and (b) all in paralle. Calculate the current sent in each case through a wire of resistance $0.8\Omega$.

View Text Solution

**93.** Two cells of 1.5 V and 2 V , having internal resistances of $1\Omega$ and $2\Omega$ respectively, are connected in parallel so as to read the current in the same direction through an external resistance of $5\Omega$ . The current in the external resistance will be

Watch Video Solution

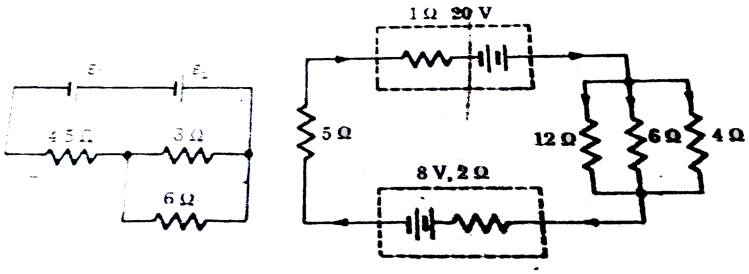
**94.** Three identical, each of emf 2 V and internal resistance $0.2\Omega$ are connected in series to an external resistor of $7.4\Omega$. Calculate the current in the circuit.

View Text Solution

**95.** Three identical cells each of emf 2 V and unknown internal resistance are connected in parallel. This combination is connected to a $5\Omega$ resistor. If the terminal voltage across the cells is 1.5 V, what is the internal resistance of each cell ?

View Text Solution

**96.** In the circuit shown in Fig. 4.68, the cells $\varepsilon_1$ and $\varepsilon_2$ have emf's of 4 V and 8 V and internal resistances of $0.5\Omega$ and $1\Omega$ respectively. Calculate the current in each resistance.




View Text Solution

View Text Solution

**97.** A 20 V battery of internal resistance $1\Omega$ is connected to three coils of $12\Omega, 6\Omega$ and $4\Omega$ in parallel, a resistor of $5\Omega$ and a reversed battery (emf=8 V and internal resistance $= 2\Omega$), as shown in Fig. 4.69. Calculate the current in each resistor and the terminal potential difference across each battery.

View Text Solution

**98.** Two cells connected in series have electromotive force of 1.5 V each. Their internal resistances are $0.5\Omega$ and $0.25\Omega$ respectively. This combination is connected to a resistance

of $2.25\Omega$. Calculate the current flowing in the circuit and the potential differnce across the terminals of each cell.

View Text Solution

**99.** Find the minimum number of cells required to produce an electric current of 1.5 A through a resistance of $30\Omega$. Given that the emf of each cell is 1.5 V and internal resistance $1.0\Omega$.

View Text Solution

**100.** How would you arrange 64 similar cells each having an emf of 2.0 V and internal resistance $2\Omega$ so as to send maximum current through an external resistance of $8\Omega$.

View Text Solution

**101.** When 10 cells in series are connected to the ends of a resistance of $59\Omega$, the current is found to be 0.25 A, but when the same cells after being connected in parallel are joined to the ends of a $0.05\Omega$, the current is 25 A. Calculate the internal resistance and emf of each cell.

Watch Video Solution