12 Current Electricity

Electric Current

- Electric Current $= \frac{\text{Electric Charge}}{\text{time}} \Rightarrow I = \frac{Q}{t} = \frac{ne}{t} = nef = \frac{nev}{2\pi r}$

  In SI system, unit of electric current is Ampere (A).

  Dimensional formula of electric current is $M^oL^oT^oA^1$ or $M^oL^oT^{-1}Q^1$.

  $1mA = 10^{-3}$ A ; $1\mu A = 10^{-6}$ A

  Electric Current, $I = \frac{dQ}{dt}$, $\therefore dQ = I\ dt$

- Electric charge $Q = \int dQ = \int I\ dt$

---

(1) An Electron revolves in circular orbit of radius $5.3. \times 10^{-11}$ m in hydrogen atom with constant speed of _____ so that $1.06\ m$A current is constituted.

(A) $2 \times 10^6\ ms^{-1}$ (B) $1.1 \times 10^6\ ms^{-1}$ (C) $2.2 \times 10^6\ ms^{-1}$ (D) $1.5 \times 10^6\ ms^{-1}$

(2) $9\ m$A electric current is flowing through a conducting wire then number of electrons passing through it in 3min is _____ .

(A) 2×10^{18} (B) 1×10^{18} (C) 2×10^{19} (D) 1.01×10^{19}

(3) A current through a wire varies with time as $I = I_0 + \alpha t$ where $I_0 = 100$ A and $\alpha = 8\ As^{-1}$. Then the charge flows across a cross section of the wire in first 20 sec _____ .

(A) 2000 (B) 3600 (C) 1600 (D) 400

(4) An electron in the hydrogen atom is revolving around nucleus in the orbit of radius $\frac{h^2}{16\pi^2 me^2}$ with speed $\frac{4\pi e^2}{h}$. Then the equation of electric current will be _____ . Here m = mass of Electron, e = Charge of electron.

(A) $\frac{4\pi^2 me^5}{h^3}$ (B) $\frac{4\pi^2 me^3}{h^5}$ (C) $\frac{32\pi^2 me^5}{h^3}$ (D) $\frac{32\pi me^3}{h^5}$

(5) The current flowing through wire changes with time as $I = (3 + 2t)$ then the electric charge flowing through any cross-section of wire in time $t = 0$ s to $t = 4$ s will be _____ C

(A) 20 (B) 24 (C) 28 (D) 14

Ans. : 1 (C), 2 (D), 3 (B), 4 (C), 5 (C)

- Drift velocity and Mobility

  Electric current density, $J = \frac{\Delta I}{\Delta a\, Cos\theta} = \frac{I}{A}$

  Drift velocity of electron in conductor, $(v_d) = \frac{\text{Effective displacement of electron}}{\text{Time Interval}}$

  $v_d = a.\tau$ but $F = ma = eE \Rightarrow a = \frac{eE}{m}$

  $\therefore v_d = \left[\frac{eE}{m}\right]\tau$, where, $\tau =$ Relaxation time of electron

- Electric current density, $J = \frac{I}{A} = nev_d$

  $\sigma E = nev_d$

  $\frac{1}{\rho} E = ne\left[\frac{Ee}{m}\tau\right] \quad \left[\because \sigma = \frac{1}{\rho}\right]$

  $\therefore$ Resistivity, $\rho = \frac{m}{ne^2\tau}$

- Mobility for material, $\mu = \frac{v_d}{E} = \frac{\sigma}{ne}$ and conductivity $\sigma = ne\mu$

  SI unit of mobility is $m^2 v^{-1} s^{-1}$.

---

(6) An electron covers 4×10^{-4} m distance in presence of electric field and 10^{-4} m distance in absence of electric field. Then it's drift velocity is _____. Electric field is applied for 10 s.

(A) 3×10^{-5} ms^{-1} (B) 4×10^{-3} ms^{-1} (C) 2×10^{-5} ms^{-1} (D) 3×10^{-4} ms^{-1}

(7) 10A electric current is flowing through the copper wire having cross sectional area of $6mm^2$. The drift velocity of electron flowing through this wire is _____.

$M_{cu} = 63.5$ kg/kmol, Density of copper $= 8920$ kg m^{-3}

(A) 1.2×10^{3} ms^{-1} (B) 1.2×10^{-3} ms^{-1} (C) 1.2×10^{-4} ms^{-1} (D) 0.12 ms^{-1}

(8) An electric current density of $5Am^{-2}$ is obtained when 8×10^{-8} Vm^{-1} electric field is applied to conducting wire, then resistivity of conductor is _____.

(A) $1.6\times10^{-8}\ \Omega$m (B) $2\times10^{-8}\ \Omega$m (C) $16\times10^{-5}\ \Omega$m (D) 20 Ωm

(9) 6×10^{12} electrons are flowing through any cross-section of conductor per unit time with drift velocity 8×10^{10} ms^{-1}. If cross-sectional area of conductor is 4 cm^2 then electric current flowing through conductor is _____ A.

(A) 307.2 (B) 30.72 (C) 3.072 (D) 6.015

(10) In two conducting wires of same material, same current is flowing. If ratio of radii of wires is 1:4 and drift velocity of electron in thick wire is v_d then drift velocity of electron in thin wire is _____.

(A) $\frac{v_d}{16}$ (B) $\frac{v_d}{4}$ (C) $16\ v_d$ (D) $4\ v_d$

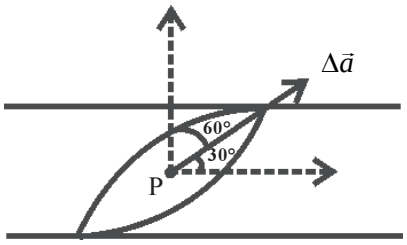
(11) The relaxation time for collision of electron with proton in a conducting wire is 18.2×10^{-12} s, then mobility of conductor is _____.

(A) $16\ \text{Cs kg}^{-1}$ (B) $1.6\ \text{Cs kg}^{-1}$ (C) $1.6 \times 10^{-2}\ \text{Cs kg}^{-1}$ (D) $3.2\ \text{Cs kg}^{-1}$

(12) In conducting wire having electron density 8×10^{12}, the average time interval between two successive collision for electron with ions is 4×10^{-12} s and mass of ions is 2.56×10^{-27} kg, then the resistivity of that conducting wire is _____ Ωm.

(A) 31.25×10^{10} (B) 0.31×10^{10} (C) 0.66×10^{10} (D) 0.36×10^{10}

(13) Area of the plane shown in figure is 2cm^2. 4A current is flowing through the wire, then the electric current density at point P of conductor will be.



(A) $4\sqrt{3} \times 10^4\ \text{Am}^{-2}$ (B) $\frac{4}{\sqrt{3}} \times 10^4\ \text{Am}^{-2}$

(C) $4 \times 10^4\ \text{Am}^{-2}$ (D) $2 \times 10^4\ \text{Am}^{-2}$

(14) Two conductors having same diameter have resistivities ρ_1 and ρ_2, and lengths l_1 and l_2. Then resultant resistivity of series combination of these two conductor is _____ .

(A) $\frac{\rho_1 l_1 + \rho_2 l_2}{l_1 + l_2}$ (B) $\frac{\rho_1 l_2 + \rho_2 l_1}{l_1 - l_2}$ (C) $\frac{\rho_1 l_2 + \rho_2 l_1}{l_1 + l_2}$ (D) $\frac{\rho_1 l_1 + \rho_2 l_2}{l_1 - l_2}$

(15) The current density along the axis of a cylindrical conductor having radius equal to R is given by $J = J_0 \frac{r^3}{R^4}$. Then the current along the conductor is _____. The distance from the axis is *r*.

(A) $\frac{\pi J_0 R^2}{2}$ (B) $\frac{2\pi J_0 R}{5}$ (C) $\frac{\pi J_0 R^2}{5}$ (D) $\frac{\pi^2 J_0 R}{2}$

(16) 0.4 *m*m diameter copper wire is connected with 2 *m*m diameter iron wire and 4 *m*A current is passed through copper wire then current density in iron wire will be _____.

(A) $1.27 \times 10^3\ \text{Am}^{-2}$ (B) $2 \times 10^5\ \text{Am}^{-2}$ (C) $1.5 \times 10^6\ \text{Am}^{-2}$ (D) $3 \times 10^3\ \text{Am}^{-2}$

Ans. : 6 (A), 7 (C) , 8 (A), 9 (B), 10 (C), 11 (D) 12 (B), 13 (C), 14 (A), 15 (B), 16 (A)

Ohm's law : $R = \frac{V}{I} \Rightarrow V = IR$.

- Electrical Resistivity and conductivity

Resistance $R = \rho \frac{l}{A}$, where ρ = Resistivity of material of wire

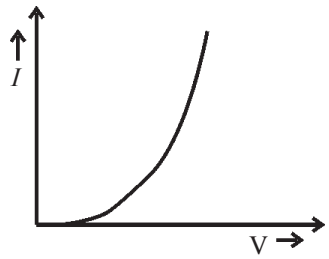
$V = IR = \frac{I \rho l}{A} = J \rho l$, but $V = El$

$\therefore E = J \rho$

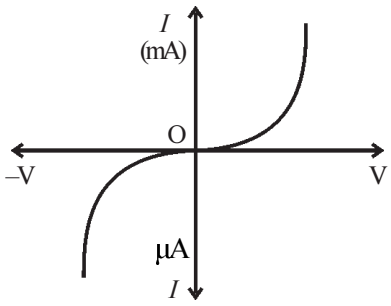
Conductivity, $\sigma = \frac{1}{\rho}$ unit of conductivity is $\mho m^{-1}$ or siemen m^{-1}

Limitations of ohm's law

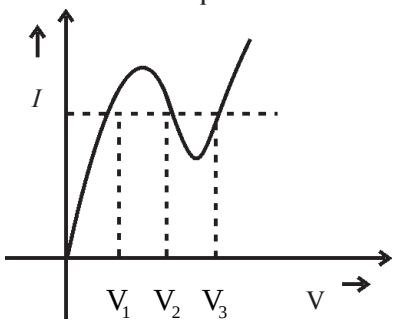
(i) In practice, for some devices, V – *I* relationship are nonlinear e.g. diode, transistor



(ii) Relation of V and I depends on sign of V.



(iii) The relation between $V \rightarrow I$ is not unique. i.e. there is more than one value of V for same current (*I*).



(17) By stretching uniformly, the length of copper wire is increased by *n* times or it's radius is made $\frac{1}{\sqrt{n}}$ times then it's resistance will be increased by _____ times.

(A) n (B) n^2 (C) n^3 (D) n^4

(18) The electric current is flowing through two parallel wires having same material. If the ratio of lengths and radii are $\frac{8}{6}$ and $\frac{4}{6}$ then the ratio of currents flowing through wires is _____.

(A) 3 (B) $\frac{1}{3}$ (C) $\frac{8}{9}$ (D) 2

(19) The material of resistivity ρ is filled between two concentric spherical shells of radil a and b $(b > a)$ then the resistance of space between these two spherical shells is _____.

(A) $\frac{\rho}{4\pi\,(a+b)}$ (B) $\frac{\rho}{4\pi}\left[\frac{1}{b}-\frac{1}{a}\right]$ (C) $\frac{\rho}{4\pi}\left[\frac{1}{a^2}-\frac{1}{b^2}\right]$ (D) $\frac{\rho}{4\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$

(20) The dimensions of block is $6\,\text{cm} \times 4\,\text{cm} \times 2\,\text{cm}$. The ratio of maximum and minimum resistances obtained between mutually opposite sides is _____.

(A) 9 : 1 (B) 1 : 9 (C) 1 : 6 (D) 1 : 18

(21) The resistance per unit length of wire is $6\,\Omega$. If the wire is bent to form a circle of radius 12 cm then the resistance between two diametrically opposite points will be _____.

(A) $0.72\,\pi\,\Omega$ (B) $0.36\,\pi\,\Omega$ (C) $0.24\,\pi\,\Omega$ (D) $1.44\,\pi\,\Omega$

(22) The charge flowing through each resistance changes with time as $Q = \alpha t - \beta t^2$, then current through resistance R will be maximum at time _____.

(A) $\frac{\alpha}{2\beta}$ (B) $\frac{2\beta}{\alpha}$ (C) $\frac{\alpha^2}{2\beta^2}$ (D) $\frac{\alpha^3}{\beta}$

(23) The conducting cylinder of length l have inner and outer radii are r_1 and r_2. If resistivity of material of cylinder is ρ then the resistance between inner and outer wall at cylinder is _____.

(A) $\frac{\rho l}{2\pi}\,l_n\left[\frac{r_1}{r_2}\right]$ (B) $\frac{\rho}{2\pi l}\,l_n\left[\frac{r_1}{r_2}\right]$ (C) $\frac{\rho}{2\pi l}\,l_n\left[\frac{r_2}{r_1}\right]$ (D) $\frac{\rho l}{2\pi}\left(r_2 - r_1\right)$

(24) A wire of resistance $8\,\Omega$ is bent from the center by 180° then it's ends are joined and is twisted, So it's resistance becomes _____.

(A) $8\,\Omega$ (B) $2\,\Omega$ (C) $4\,\Omega$ (D) $1\,\Omega$

(25) A copper wire is stretched to make it longer by 0.1 %. The percentage increase in its resistance is _____.

(A) 0.1 % (B) 0.4 % (C) 0.2 % (D) 2 %

(26) When P.d. across two terminal of copper wire is increased the current flowing throgh it also increases. Then for n electric charge flowing through wire per unit volume and drift velocity V_d of electric charge, which of the fallowing statement is true ?

(A) n constant and v_d decreases (B) n constant and v_d increases.

(C) n increases and v_d decreases (D) n increases and v_d remains constant

(27) Masses of three wires of copper are in the ratio 2 : 3 : 5 and their lengths are in ratio 3 : 5 : 7, then the ratio of their resistance is _____.

(A) 20 : 30 : 50 (B) 125 : 15 : 1 (C) 3 : 5 : 7 (D) 135 : 250 : 294

Ans. : 17 (B), 18 (B), 19 (B), 20 (A), 21 (B), 22 (A), 23 (C), 24 (B), 25 (C), 26 (B), 27 (D)

Colour code for carbon Resistors :

First Tenth Digit		Second Band Ones Digit	Third Band Multiple	Fourth Band Tolerence
Black	0	0	10°	–
Brown	1	1	10^{1}	$\pm$ 1 %
Red	2	2	10^{2}	$\pm$ 2 %
Orange	3	3	10^{3}	$\pm$ 3 %
Yellow	4	4	10^{4}	$\pm$ 4 %
Green	5	5	10^{5}	–
Blue	6	6	10^{6}	–
Violet	7	7	10^{7}	–
Gray	8	8	10^{8}	–
White	9	9	10^{9}	–
Gold	–	–	10^{-1}	$\pm$ 5 %
Silver	–	–	10^{-2}	$\pm$ 10 %
None	–	–	–	$\pm$ 20 %

To remember colour code

B B R O Y Goes to Bombay Via Gwalior.

● Temperature dependence of resistivity

The empirical formula for resistivity and temperature

$\rho_{\theta} = \rho_{\theta_0} \left[1 + \alpha (\theta - \theta_0)\right]$, where α = temperature co-efficient of resistivity

ρ_{θ} = Resistivity at a temperature θ

ρ_{θ_0} = Resistivity at proper reference temperature θ_0

The above equation can be written in the form of resistance as follows

$R_{\theta} = R_{\theta_0} \left[1 + \alpha (\theta - \theta_0)\right]$. Temerature co-efficient of Resistivity, $\alpha = \frac{R_t - R_o}{R_o \times t}$

(28) Resistance of copper wire is $5\,\Omega$ at 50 °C temperature and $6\,\Omega$ at 100 °C temperature then resistance of wire at $0°C$ temperature will be _____ Ω.

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

(29) At _____ temperature, the resistance of copper wire will be four times than it's resistance at 27 °C temperature. For copper $\alpha = 4 \times 10^{-3}\ C^{-1}$.

(A) 354 °C (B) 758 °C (C) 1023 °C (D) 1516 °C

(30) For a wire resistance at temperature $30^0\,C$ is $3.1\,\Omega$ and at temperature $100°\,C$ is $4.5\,\Omega$ then temperature co-efficient of resistivity of wire, α = _____.

(A) $0.0012\ °C^{-1}$ (B) $0.0024°C^{-1}$ (C) $0.0032\ °C^{-1}$ (D) $0.008\ °C^{-1}$

(31) An electric, toaster have resistive wire of Nicrom. When small current is passed through it at room temperature ($27\,°C$), it's resistance is obtained $75.3\,\Omega$. When toaster is connected with $230\,V$ supply, the current flowing through it is $2.68\,A$. If from Nicrom, $\alpha = 1.7 \times 10^{-4}\ °C^{-1}$ then it's final temperature will be _____.

(A) 747 °C (B) 847 °C (C) 897 °C (D) 927 °C

(32) In a platinum resistance thermometer, the resistance of platinum at $0\,°C$ is $5\,\Omega$ and at $100°C$ is $5.23\,\Omega$. When thermometer is placed in a heatbath, the resistance of platinum is obtained $5.795\,\Omega$ then temperature of heat bath is _____.

(A) 278 °C (B) 346 °C (C) 372°C (D) 412°C

(33) The resistance of tungsten wire of bulb have resistance 18Ω at $27°C$ temperature. Steady current of 0.25A is flowing through it when bulb is connected with supply of $45\,V$. For tungsten, $\alpha = 4.5 \times 10^{-3}\ K^{-1}$ then find the temperature of Bulb filament. Suppose Ohm's law is obeyed.

(A) 2160 K (B) 1800 K (C) 2070 K (D) 2300 K

(34) Two materials have the value of α_1 and α_2 as $5 \times 10^{-4}\ °C^{-1}$ and $-3.8 \times 10^{-4}\ °C^{-1}$ respectively. The resistivity of first material $\rho_{20} = 2.4 \times 10^{-8}\,\Omega m$. If new material is made by combining these two materials such that it's resistivity does not change with temperature, then what should be the resistivity ρ_{20} of second material ? Take reference temperature $20^0\,C$. Assume that the resistivity at the new material is equal to the sum of resistivity of component materials.

(A) $3.185 \times 10^{-6}\ \Omega m$ (B) $3.158 \times 10^{-9}\ \Omega m$ (C) $3.185 \times 10^{-8}\ \Omega m$ (D) $3.158 \times 10^{-8}\ \Omega m$

(35) As per colour code of carbon resistor, the resistance for the colour of Indian National flag, from upper to lower colours in order, is _____ Ω.

(A) $39 \times 10^5 \pm 20\,\%$ (B) $59 \times 10^5 \pm 20\,\%$ (C) $39 \times 10^5 \pm 10\,\%$ (D) $39 \times 10^5 \pm 5\,\%$

(36) The value of a carbon resistor is $1760\,\Omega$ to $2640\,\Omega$, then colour code at that carbon resistor is _____

(A) Brown, Red, Brown, No colour (B) Red, Red, Black, No colour

(C) Red, Black, Red, No colour (D) Red, Red, Red, No colour

Ans. : 28 (D), 29 (B), 30 (D), 31 (B), 32 (B), 33 (D), 34 (D), 35 (A), 36 (D)

- Electromotive force (emf) and terminal voltage of electric cells.

  The relation between terminal voltege and emf of cell, $V = \varepsilon - Ir$

  Where, $r =$ internal resistance of electric cell.

  Electric Force, $F_e = eE$, work $W = \int \vec{F}_n \cdot \vec{dl}$

  Non electrical force $= F_n$

  When $F_n = F_e$ then electric current flowing through the battery becomes zero $I = o$.

  which is called Open circuit condition.

- Charging current for lead Accumulator, $I = \dfrac{V - \varepsilon}{R + r}$

- Electrical energy consumed in resistance $= I^2Rt$
- Electrical energy consumed in D.C.source $= VIt$
- Energy consumed to charge electric cell $= EIt$

---

(37) An emf of battery is ε. It's terminal voltage is obtained V on connecting resistance $R\ \Omega$ with it then it's internal resistance is _____.

(A) $r = \dfrac{\varepsilon R}{V} - R$ (B) $r = \left(\dfrac{\varepsilon + V}{V}\right) R$ (C) $r = (\varepsilon - V) R$ (D) $r = \dfrac{\varepsilon}{V} - R$

(38) By an electric cell, the electric current is passed through resistance R_1 for time t. Now by the same cell, the electric current is passed through resistance R_2 for same time. If in both the cases Joule heat produced is same then internal resistance of electric cell is _____.

(A) $\dfrac{R_1 + R_2}{2}$ (B) $\dfrac{R_1 - R_2}{2}$ (C) $R_1 \times R_2$ (D) $\sqrt{R_1 \cdot R_2}$

(39) Electromotive force of electric cell is _____.

(A) Electric force (B) Non electric force (C) Energy (D) Electromagnetic force

(40) When electric cell is in open circuit condition then _____.

(A) $r = 0$ (B) $\varepsilon = 0$ (C) $V = \varepsilon$ (D) $F_n < F_e$

(41) Two batteries having same emf of 2 V and same internal resistance of $1\ \Omega$ are connected in series with external resistance R, then maximum power in R will be _____.

(A) 3.2 W (B) $\dfrac{16}{9}$ W (C) 5 W (D) 2 W

(42) An electric cell have emf 2.2 V. It's terminal voltage obtained 1.8 V on connecting $5\ \Omega$ resistance with it then internal resistance of cell will be _____.

(A) $\dfrac{10}{9}\ \Omega$ (B) $\dfrac{9}{10}\ \Omega$ (C) $\dfrac{9}{5}\ \Omega$ (D) $\dfrac{5}{9}\ \Omega$

(43) Electric current of 0.75 A is obtained on connecting $4\ \Omega$ resistance across electrodes of electric cell. But when $10\ \Omega$ resistance is connected, terminal voltage obtained is 3.75 V, then electric current flowing through cell is _____ A at that time.

(A) 0.25 (B) 0.34 (C) 0.50 (D) 1

(44) 0.9 A current is obtained on connecting $2.4\ \Omega$ resistance with electric cell. On connecting $7\ \Omega$ resistance with the same cell, 0.3 A current flows then it's internal resistance is _____ Ω.

(A) 0.4 (B) 0.5 (C) 0.3 (D) 0.2

(45) Two electric cells have same emf ε and internal resistances r_1 and r_2. These two electric cell are connected in series with external resistance R. The electric potential difference across two terminal of first electric cell is obtained zero then value of resistance R is _____.

(A) $\sqrt{r_1 r_2}$ (B) $r_1 + r_2$ (C) $r_1 - r_2$ (D) $\frac{r_1 + r_2}{2}$

Ans. : 37 (A), 38 (D), 39 (C), 40 (C), 41 (D), 42 (A), 43 (B), 44 (B), 45 (C)

Kirchoff's Rules :

(i) Kirchoff's first rule $\rightarrow \sum I = 0$

(ii) Kirchoff's second rule $\rightarrow \sum IR = \sum \varepsilon$

(a) If our journey through the resistor is in the direction of flow of current which is arbitrarily choosen, IR should be considered negative and if our journey is in the opposite direction of electric current then take IR positive.

(b) The emf of the battery should be considered negative while moving from positive terminal to negative terminal through battery but if Journey is from negative terminal to positive terminal through battery then emf should be considered positive.

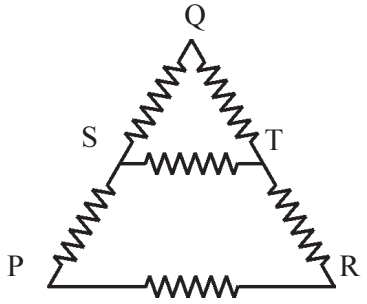
(iii) Equivalant resistance for series combination of resistances, $R = R_1 + R_2 + ... + R_n$

(iv) Equivalant resistance for parallel combination of resistances

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_n}$$

---

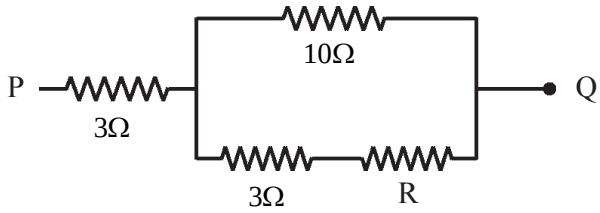
(46) Six resistances each having resistance of $10\ \Omega$ are connected as shown in the figure. The equivalent resistance between points P and R will be _____.



(A) $20\ \Omega$ (B) $\frac{80}{3}\ \Omega$

(C) $\frac{80}{11}\ \Omega$ (D) $80\ \Omega$

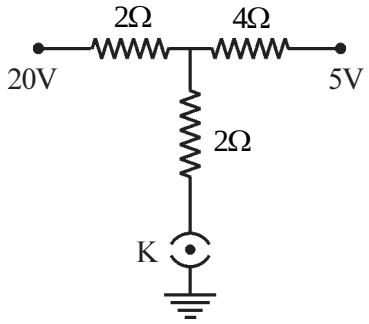
(47) In the given electrical circuit, the value of unknown resistance R should be _____ Ω, so that resultant resistance between P and Q is also R.



(A) 3 (B) $\sqrt{39}$

(C) $\sqrt{69}$ (D) 10

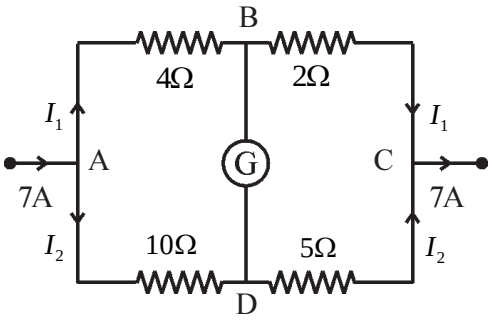
(48) When the switch is on in the following circuit, the electric current flowing through it is _____.



(A) 6 A (B) 4.5 A

(C) 3 A (D) 0 A

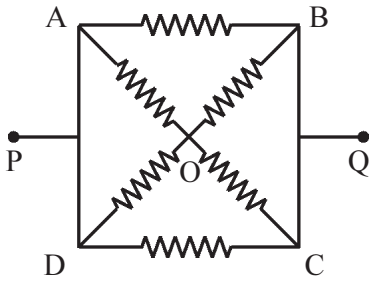
(49) When 7A current is flowing in electric circuit then the electric potential difference between B and C will be _____ volt.



(A) 16 (B) 10

(C) 8 (D) 5

(50) In the following circuit, the effective resistance between P and Q is _____.



(A) 8 Ω (B) $\frac{8}{3}$ Ω

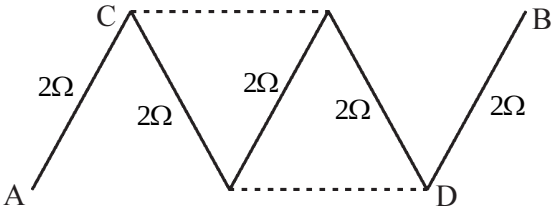
(C) 24 Ω (D) 4 Ω

Resistance of each wire is 8 Ω

(51) A cube is made by connecting 12 wires each of resistance 12 Ω. The equivalent resistance between two end points of any diagonal of cube will be _____.

(A) 6 Ω (B) 5 Ω (C) 10 Ω (D) 12 Ω

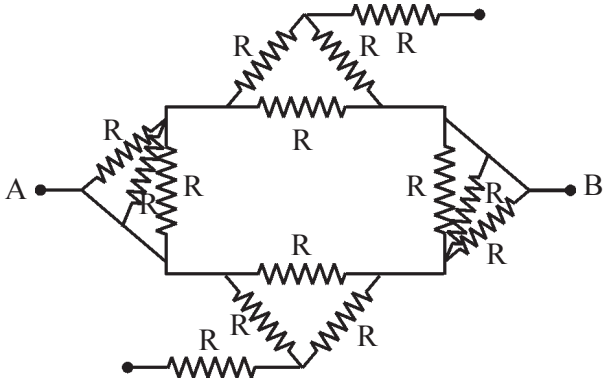
(52) Five resistances are connected as shown in figure. On the dotted line shown in figure two resistances of $2\,\Omega$ are connected. The ratio of the resistance between A and B in the circuit before and after joining resistances on dotted line is _____.



(A) $\frac{7}{5}$ (B) $\frac{3}{5}$

(C) $\frac{5}{3}$ (D) $\frac{6}{5}$

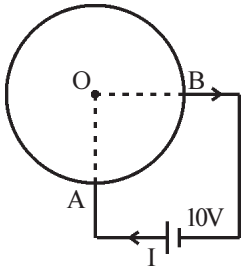
(53) The equivalent resistance between points A and B will be _____ in the given circuit.



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

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

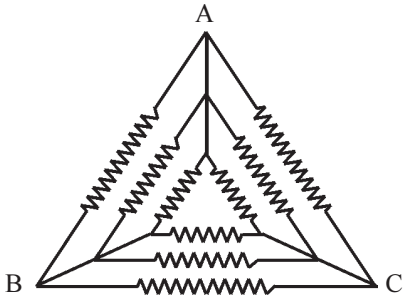
(54) A circular wire of radius 8 cm have $\frac{1}{\pi}$ resistance per unit length. Battery of 10 V is connected between points A and B on circular wire then current flowing through the battery is _____. Points A and B form right angle at center O.



(A) 3 A (B) 5 A

(C) 3.33 A (D) 10 A

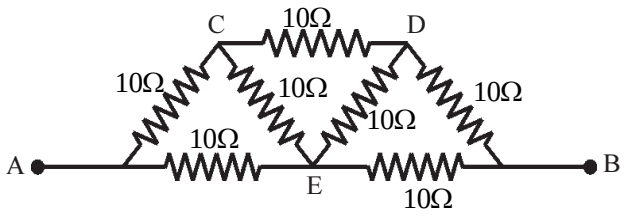
(55) Nine resistances each with value R are connected as shown in figure. Then equivalent resistance between A and B will be _____.



(A) $\frac{7}{6}$ R Ω (B) R Ω

(C) $\frac{3}{5}$ R Ω (D) $\frac{2}{9}$ R Ω

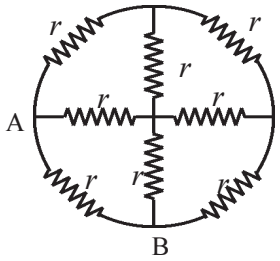
(56) The equivalent resistance between points A and B in the given circuit is _____.



(A) 50 Ω (B) $\frac{60}{11}$ Ω

(C) $\frac{80}{7}$ Ω (D) 60 Ω

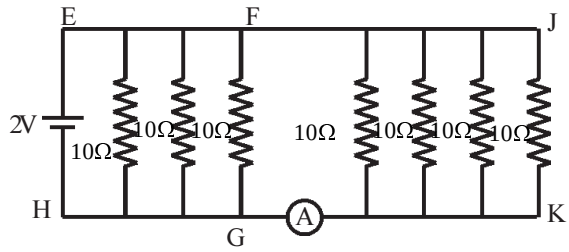
(57) In a given circuit, resistance of each resistor is *r*. Then equivalent resistance between A and B is



(A) $\frac{3}{4}r$ (B) $\frac{2}{3}r$

(C) $\frac{8}{15}r$ (D) $\frac{8}{7}r$

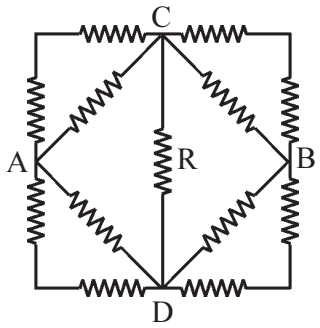
(58) Seven resistances each of 10 Ω are connected with 2 V battery as shown in the figure, then current flowing through ammeter will be _____.



(A) 2 A (B) 1 A

(C) 0.4 A (D) 0.8 A

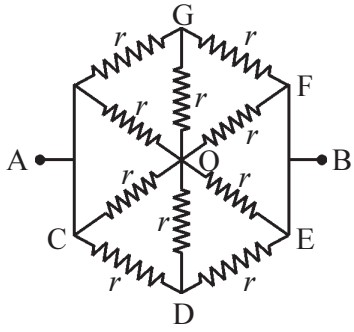
(59) Thirteen resistors each of resistance R Ω are connected in the circuit as shown in the figure. The effective resistance between A and B is _____.



(A) 2R Ω (B) $\frac{4R}{3}$ Ω

(C) $\frac{2R}{3}$ Ω (D) R Ω

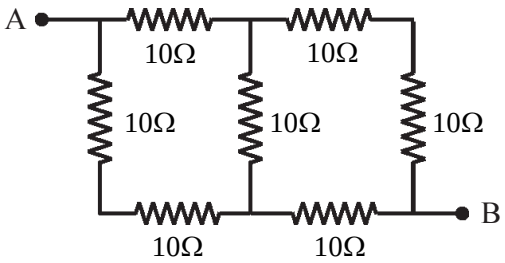
(60) The effective resistance between points A and B in the given network shown in the figure will be _____.



(A) *r* Ω (B) 2*r* Ω

(C) 4*r* Ω (D) $\frac{r}{2}$ Ω

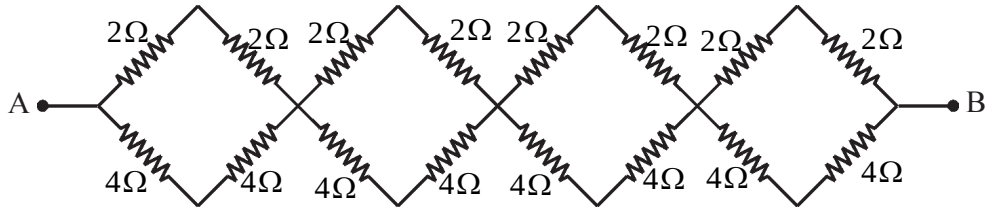
(61) The effective resistance between points A and B in given adjacent circuit will be _____



(A) 10 Ω (B) 5 Ω

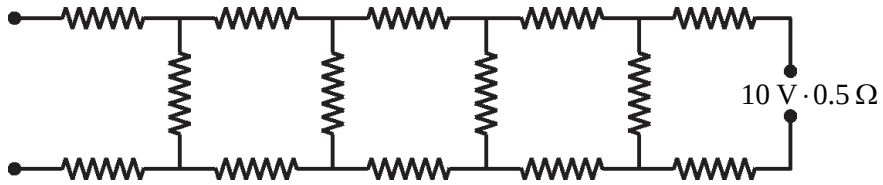
(C) 20 Ω (D) 14 Ω

(62) The equivalent resistance of given network is _____.



(A) 8 Ω (B) $\frac{16}{3}$ Ω (C) $\frac{32}{3}$ Ω (D) 32 Ω

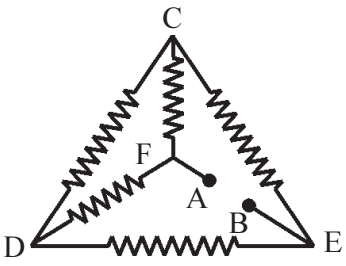
(63) The electric current flowing through the battery, of 10V and internal resistance 0.5 Ω, connected with an infinite network formed by resistances each of value 4 Ω is _____ A.



(A) 0.88 (B) 0.5 (C) .74 (D) 0.2

(64) The equivalent resistance between points A and B in the following network will be _____

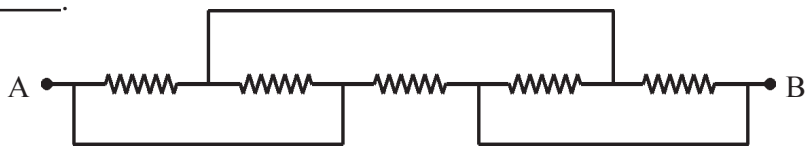
Each resistance is of 2 Ω.



(A) 2 Ω (B) 1 Ω

(C) 3 Ω (D) 4 Ω

(65) Each resistance of network is of 4 Ω, then the effective resistance between points A and B will be _____.



(A) 1 Ω (B) 2 Ω (C) 4 Ω (D) 8 Ω

(66) Two wires with same length have ratio of their cross-sectional area 3:1. If resistance of thick wire is $10\ \Omega$ then the equivalent resistance of series combination of both wire is _____.

(A) $40\ \Omega$ (B) $\frac{40}{3}\ \Omega$ (C) $\frac{5}{2}\ \Omega$ (D) $100\ \Omega$

(67) A polygon of *n* sides is formed from the wire of uniform cross-section and resistance R. Sides of polygon are in even number. Then the ratio of equivalent resistance between mutually opposite points and equivalent resistance between two end points of any side will be _____.

(A) $\frac{4(n-1)}{n^2}$ (B) $\frac{2(n-1)}{n^2}$ (C) $\frac{4(n-1)}{n}$ (D) $\frac{2n^2}{(n-1)}$

(68) Three resistances are in ratio 1 : 2 : 3. The equivalent resistance in parallel combination is $6\ \Omega$ then equivalant resistance in series combination will be _____.

(A) $36\ \Omega$ (B) $84\ \Omega$ (C) $66\ \Omega$ (D) $18\ \Omega$

(69) When two resistances R_1 and R_2 are connected in series, their equivalent resistance is $50\ \Omega$ and $12\ \Omega$ when connected in parallel, then the values of these resistances will be _____ and _____.

(A) $30\ \Omega, 20\ \Omega$ (B) $40\ \Omega, 10\ \Omega$ (C) $35\ \Omega, 15\ \Omega$ (D) $45\ \Omega, 5\ \Omega$

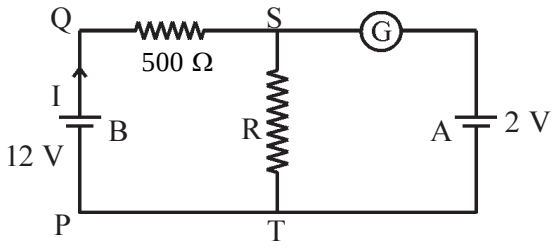
(70) When R_1 and R_2 are connected in series, the equivalent resistance is R_S and when connected parallel the equivalent resistance is R_p. If $R_S \cdot R_P = 16$ and $\frac{R_1}{R_2} = 4$ then R_1 _____ and R_2 = _____.

(A) $2\ \Omega, 0.5\ \Omega$ (B) $1\ \Omega, 0.25\ \Omega$ (C) $8\ \Omega, 2\ \Omega$ (D) $4\ \Omega, 1\ \Omega$

(71) In series combination of two resistors, the equivalent resistance is S. When connected parallel, the equivalent resistance is P. If S = nP then the minimum value of *n* will be _____.

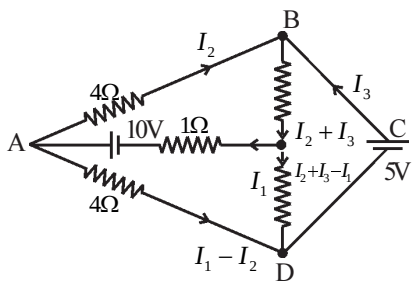
(A) 3 (B) 4 (C) 2 (D) 1

(72) The galvanometer shows zero deflection in the circuit shown in figure. If internal resistances of battery A and B is negligible then value of R is _____.



(A) $500\ \Omega$ (B) $1000\ \Omega$
(C) $200\ \Omega$ (D) $100\ \Omega$

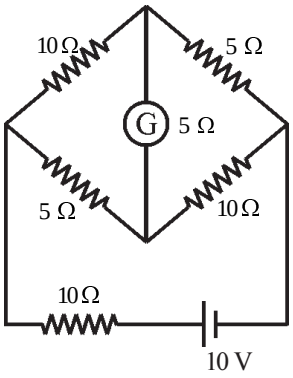
(73) For the given network currents; I_1, I_2 and I_3 are _____ .



(A) $\frac{5}{2}A, \frac{5}{8}A, \frac{15}{8}A$ (B) $A\frac{5}{3}A, \frac{5}{8}A, \frac{12}{8}A$

(C) $\frac{5}{2}A, \frac{15}{8}A, \frac{5}{3}A$ (D) $\frac{5}{3}A, \frac{5}{2}A, \frac{15}{3}A$

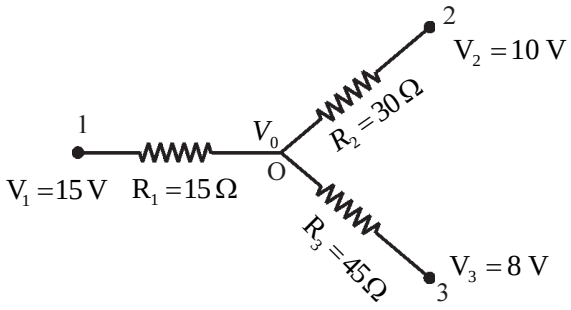
(74) The resistance of galvanometer is $5\ \Omega$ is connected in adjacent circuit, then current flowing through the galvanometer will be _____.



(A) $\frac{1}{17}$ A (B) $\frac{2}{17}$ A

(C) $\frac{3}{17}$ A (D) $\frac{4}{17}$ A

(75) For the given circuit, obtain current flowing through resistance R_1 and electric potential at junction O.



(A) $I_1 = 19$ A, $V_o = 12.375$ V

(B) $I_2 = 1.75$ A, $V_o = 12.15$ V

(C) $I_1 = 0.175$ A, $V_o = 12.375$ V

(D) $I_1 = 0.19$ A, $V_o = 1.215$ V

Ans. : 46 (C), 47 (C), 48 (B), 49 (B), 50 (B), 51 (C) 52 (C), 53 (C), 54 (C), 55 (D), 56 (C), 57 (C), 58 (D), 59 (C), 60 (D), 61 (D), 62 (C), 63 (A), 64 (A), 65 (B), 66 (A), 67 (A), 68 (C), 69 (A), 70 (C), 71 (B), 72 (D), 73 (A), 74 (B), 75 (C)

(1) The current flowing in circuit for series combination of two cells, $I = \frac{\varepsilon_{eq}}{R + r_{eq}}$

Where, $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2 =$ Equivalent emf of series connection of two cells

and, $r_{eq} = r_1 + r_2 =$ Equivalant internal resistance of series connection of to cells.

(2) The current flowing in circuit for parallel combination of two cells, $I = \frac{\varepsilon_{eq}}{R + r_{eq}}$

Where, $\varepsilon_{eq} = \frac{\varepsilon_1 r_2 + \varepsilon_2 r_1}{r_1 + r_2} =$ Equivalent emf of parallel combination of two cells.

$r_{eq} = \frac{r_1 r_2}{r_1 + r_2} =$ Equivalant internal resistance of parallel combination of two cells.

(3) For mix combination of n cells, the current flowing in the circuit

$I = \dfrac{\sum_{i=1}^{n} \varepsilon_i}{R + \dfrac{\sum r_i}{m}}$ where, m = number of rows formed by series combination of n cells.

---

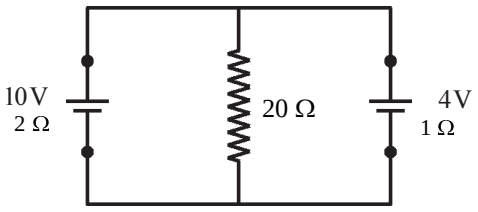
(76) Resistance of an ammeter is $0.02\ \Omega$. When it is connected with a battery, it shows 8 A current. Now if $3\ \Omega$ resistance is connected in series, the current is decreased by 6 A then emf of battery is _____ V and internal resistance is _____.

(A) 0.49 V, $2\ \Omega$ (B) 0.98 V, $8\ \Omega$ (C) 8 V, $0.98\ \Omega$ (D) 2 V, $4.9\ \Omega$

(77) n electric cells each with emf ε and internal resistance r are connected in closed cricuit. In this, cell A is connected in destructive manner. Then except for cell A the electric potential difference for each cell is _____.

(A) $\dfrac{2\varepsilon}{n}$ (B) $\left(\dfrac{n-1}{n}\right)\varepsilon$ (C) $\left(\dfrac{n}{n-1}\right)\varepsilon$ (D) $\left(\dfrac{n-2}{n}\right)\varepsilon$

(78) Two cells of emf 10 V, Internal resistance $2\ \Omega$ and emf 4 V and internal resistance $1\ \Omega$ are connected with $20\ \Omega$ resistance as shown in figure, then current flowing through $20\ \Omega$ resistance is _____.



(A) 0.06 A (B) 0.03 A
(C) 0.1 A (D) 2 A

(79) Two cells each with emf 4 V and internal resistance $2\ \Omega$ are connected in parallel then current flowing by these two cells from $1\ \Omega$ resistance is _____ A.

(A) 0.5 (B) 1 (C) 2 (D) 4

Ans. : 76 (C), 77 (A), 78 (B), 79 (C)

(a) Wheatstone Bridge

(1) Ratio of resistances in balance conditation of wheatstone bridge, $\dfrac{R_1}{R_2} = \dfrac{R_3}{R_4}$

(2) Experimentally resistance measured with meter bridge, $R_1 = R_2 \dfrac{l_1}{(100 - l_1)}$

(b) Potentiometer

(1) The current flowing through potentiometer circuit, $I = \dfrac{\varepsilon}{R + L\rho + R}$

Where, $L\rho$ = Resistance of potentiometer wire

(2) emf of battery measured with potentiometer, $V_l = \left[\frac{\varepsilon\rho}{R + L\rho + r}\right] l$

(3) Potential gradient of potentiometer wire, $\sigma = \frac{V_l}{l} = \frac{\varepsilon\rho}{R + L\rho + r}$.

(4) Comparison of emf of two cells, $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$.

(5) For constructive and destructive combination of cells $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_3 + l_4}{l_3 - l_4}$

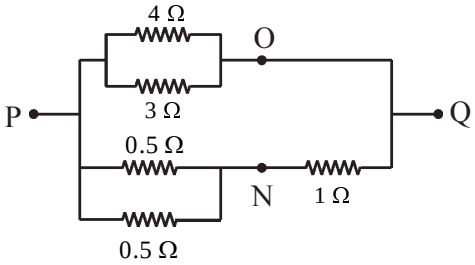
(6) Internal resistance of cell by potentiometer, $r = \left[\frac{\varepsilon}{V} - 1\right] R = \left[\frac{l_1 - l_2}{l_2}\right] R$

---

(80) When $5\,\Omega$ resistance is in one branch and $R\,\Omega$ resistance is in other branch of wheastone bridge, the null point is obtained at distance l_1. It another resistance $R\,\Omega$ is connected in parallel with R then new null point is obtained at $1.6\,l_1$. Then value of R will be _____.

(A) $10\,\Omega$ (B) $15\,\Omega$ (C) $20\,\Omega$ (D) $25\,\Omega$

(81) When D.C. voltage is applied between P and Q in the following circuit, the current flowing through $4\,\Omega$ resistance is 1 A, then p.d. between points P and Q is _____.

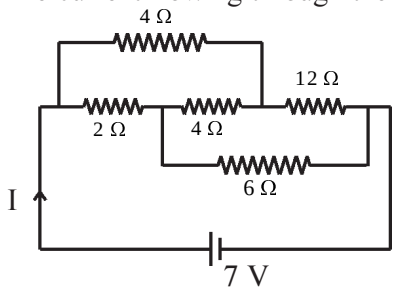


(A) 0.5 V (B) 3.2 V
(C) 1.5 V (D) 1 V

(82) Length of a potentiometer wire is 200 cm. The emf of standard battery is ε V. It is used to find emf of battery having $1\,\Omega$ internal resistance. If null point is obtained at 40 cm from the positive terminal then emf of battery is _____.

(A) ε (B) $\frac{\varepsilon}{2}$ (C) $\frac{\varepsilon}{5}$ (D) $\frac{\varepsilon}{4}$

(83) The current flowing through the battery in the given network will be _____.



(A) 1.55 (B) 3
(C) 3.5 (D) 4

(84) In the balanced condition of meterbridge if x resistance is connected in left branch and y resistance is connected in right branch, the null point is obtained at distance 39.5 cm. If value of resistance y is $12.5\ \Omega$ then value of resistance x will be _____.

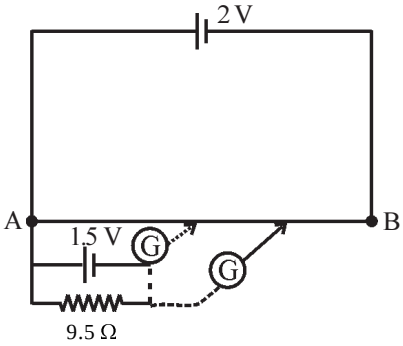
(A) $6.7\ \Omega$ (B) $8.2\ \Omega$ (C) $9.1\ \Omega$ (D) $10.5\ \Omega$

(85) In the electric circuit of potentiometer, two cell are connected in series in

(i) helping mode (ii) opposing mode then the null points are obtained at distances 6 m and 2 m respectively. Then the ratio of emf of cells will be _____.

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

(86) As shown in the figure to find internal resistance of 1.5 V battery, the potentiometer of emf 2 V is used. In open circuit condition of battery, the null point is obtained at distance 76.3 cm. Now, $9.5\ \Omega$ resistance is connected in outer circuit, the null point is obtained at distance 64.8 cm then internal resistance of cell will be _____ .



(A) $1.5\ \Omega$ (B) $1.6\ \Omega$

(C) $1.7\ \Omega$ (D) $1.8\ \Omega$

(87) In experiment of potentiometer for comparison of two cells of emf ε_1 and ε_2, the null point is obtained at distance 64 cm in series combination (helping mode). If poles of ε_2 are reversed, the null point is obtained at distance 32 cm then $\frac{\varepsilon_1}{\varepsilon_2}$ = _____ .

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

(88) $20\ \Omega$ resistance is in one branch and $60\ \Omega$ resistance is in other branch of meterbridge. If resistances are interchanged in the branches then the null point will be displaced by distance _____.

(A) 33.3 cm (B) 66.67 cm (C) 25 cm (D) 50 cm

(89) The specific resistance of potentiometer wire is $10^{-12}\ \Omega$ and current flowing through it is 0.5 A. If area of cross section of wire is $10^{-6}\ m^2$ then potential gradient will be _____ Vm^{-1}.

(A) 2.5×10^{-7} (B) 5×10^{-7} (C) 7.5×10^{-7} (D) 10×10^{-7}

(90) The potentiometer wire of length 10 m and resistance $40\ \Omega$ is connected with resistance box and cell of 2 V. If potential gradient is of $0.1\ mVcm^{-1}$ then the resistance R = _____ from the resistance box. .

(A) $260\ \Omega$ (B) $760\ \Omega$ (C) $960\ \Omega$ (D) $1060\ \Omega$

Ans. : 80 (B), 81 (B), 82 (C), 83 (A), 84 (B), 85 (C), 86 (C), 87 (C), 88 (D), 89 (B), 90 (B)

Electrical energy and power

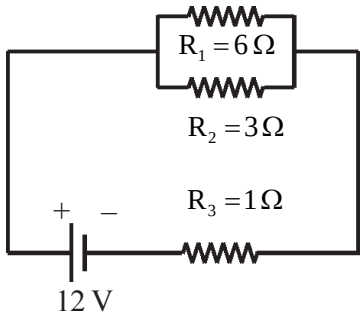
Electrical energy consumed, $W = VIt = I^2Rt = \frac{V^2}{R}t$

Joule's law, The heat energy produced, $P = I^2R\,t$

Now, $J = \frac{W}{H} \Rightarrow H = \frac{W}{J} = \frac{I^2Rt}{J}$

---

(91) In the following circuit the heat produced per minute in $R_2 = 3\,\Omega$ resistance will be _____ J.



(A) 640 (B) 1280

(C) 960 (D) 320

(92) There are 15 bulbs each of 40 W, 5 bulbs each of 100 W, 5 fans each of 80 W and a heater of 1 kW in a house. Electric source has potential of 220 V. Then the fuse in the house should be with minimum capacity of _____ A.

(A) 12 (B) 14 (C) 8 (D) 10

(93) An electric motor draws 5 A electric current when connected with 200 V D.C. supply. If efficiency of motor is 60 % then resistance of winding wire of motor will be _____.

(A) 4 Ω (B) 8 Ω (C) 16 Ω (D) 24 Ω

(94) *n* bulbs are made such that each have power P for same supply voltage. If all are connected in series with same supply voltage then power drawn in each will be _____.

(A) P (B) nP (C) $\frac{P}{n}$ (D) $\frac{P}{n^2}$

(95) Two filaments of same length are first connected in series and then connected in parallel. For the same current of source, the ratio of heat produced in both the cases will be _____.

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

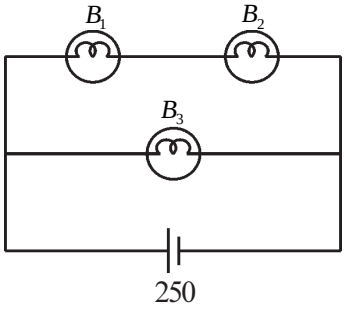
(96) Two resistances R_1 and R_2 are connected with a battery of zero internal resistance. The Joule heat produced in parallel combination should be 5 times than the Joule heat produced in series combination. If resistance $R_1 = 100\,\Omega$ then R_2 = _____ Ω.

(A) 200 or 30 (B) 249 or 51 (C) 262 or 38 (D) 410 or 65

(97) The rate of melting of ice when 210 V supply is given to the wire of 20 Ω resistance passed through ice will be _____.

(A) 6.56 gs^{-1} (B) 5.66 gs^{-1} (C) 1.92 gs^{-1} (D) 0.85 gs^{-1}

(98) A bulb B_1 of 100 W-250 V rating and two bulbs B_2 and B_3 of 60 W, 250 V rating are connected with supply of 250 V as shown in the figure. If W_1, W_2 and W_3 are output power of bulb 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) $W_1 < W_2 < W_3$

(99) The water in the electric kettle start boiling after 15 minute. Now if length of heating wire of electric kettle is made $\frac{2}{3}$ times than initial length, then the same amount of water will start boiling after _____ time for same supply voltage.

(A) 8 minute (B) 10 minute (C) 12 minute (D) 15 minute

(100) The series combination of four identical resistors connected with battery consumes 20W power. If these four resistances are connected parallel to the same battery then power consumed will be _____

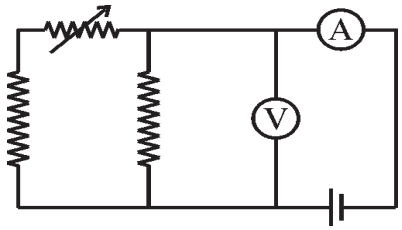
(A) 80 W (B) 100 W (C) 5 W (D) 320 W

Ans. : 91 (B), 92 (A), 93 (C), 94 (C), 95 (B), 96 (C), 97 (A), 98 (D), 99 (B), 100 (D)

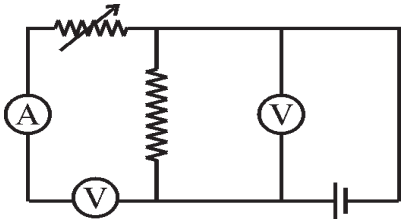
Question related to experiments

(101) Which of the following circuit can be used to prove Ohm's law ?

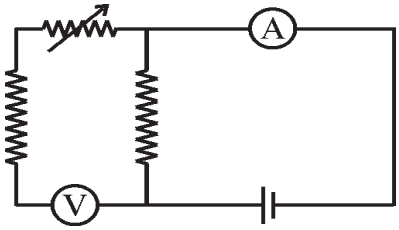
(A)



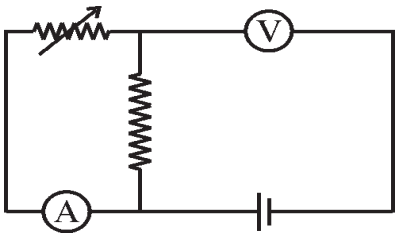
(B)



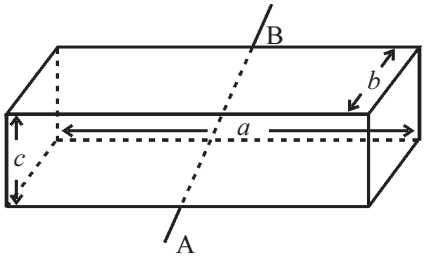
(C)



(D)



(102) The dimensions of a conductor having specific resistance ρ are as shown in figure. Then what will be effective resistance between A and B ?



(A) $\frac{\rho b}{ac}$ (B) $\frac{\rho a}{bc}$

(C) $\frac{\rho ab}{c}$ (D) $\frac{\rho c}{ab}$

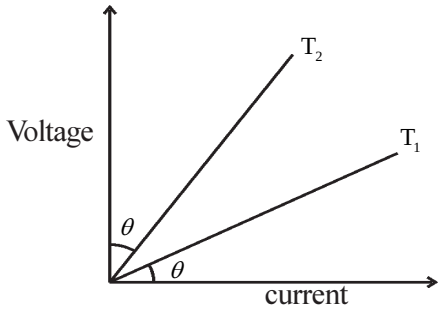
(103) The resistance of a conductor is $2\,\Omega$ at 300 K temperature, then at what temperature it's resistance will be $4\,\Omega$? For this resistance $\alpha = 1.25 \times 10^{-3}\ °C^{-1}$.

(A) 1100 °C (B) 827 °C (C) 1127 °C (D) 800 °C

(104) The equivalant resistance of parallel combination of n resistances is $x\,\Omega$. When one resistance is removed from this combination, the equivalent resistance becomes $y\,\Omega$. Then the value of removed resistance will be _____.

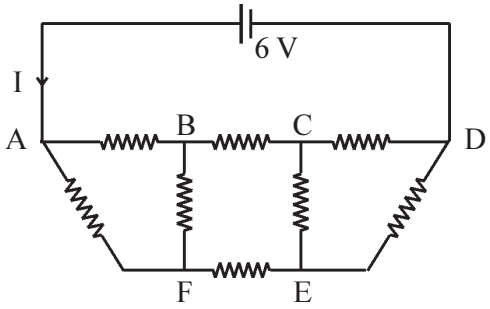
(A) $\frac{xy}{(x+y)}$ (B) $\frac{xy}{(y-x)}$ (C) $(y-x)$ (D) $\sqrt{xy}$

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



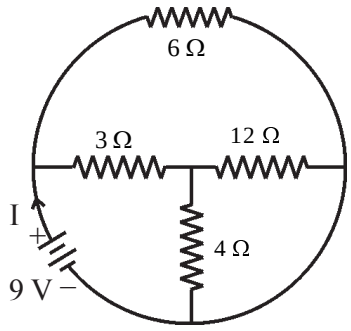
(A) $\cos 2\theta$ (B) $\sin 2\theta$
(C) $\cot 2\theta$ (D) $\tan 2\theta$

(106) As shown in the figure, eight resistances each of $4\,\Omega$ are connected with battery of 6 V and negligible internal resistance. Then the current flowing in circuit I = _____ .



(A) 0.25 A (B) 0.50 A
(C) 0.75 A (D) 1.0 A

(107) The electric current flowing through the battery in given circuit will be _____ A.



(A) 2 A (B) 3 A
(C) 6 A (D) 9 A

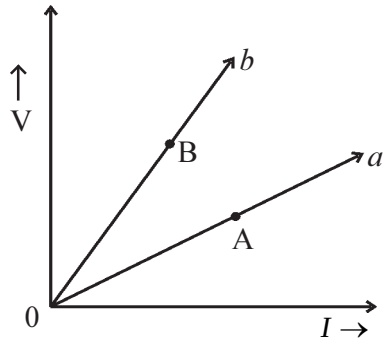
(108) A wire of resistance R is compressed uniformly till its radius becomes n times the initial radius, then new resistance of wire will be _____.

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

(109) Three identical resistors connected in series with source of emf consumes 100 W power. If three resistances are connected in parallel with same source of emf then the power consumed will be _____W.

(A) $\frac{100}{3}$ (B) 100 (C) 300 (D) 900

(110) $V \rightarrow I$ graphs for series and parallel connection of two identical resistors are as shown in figure. Which graph is for parallel connection ?



(A) a
(B) b
(C) a and b
(D) Not any one from a and b

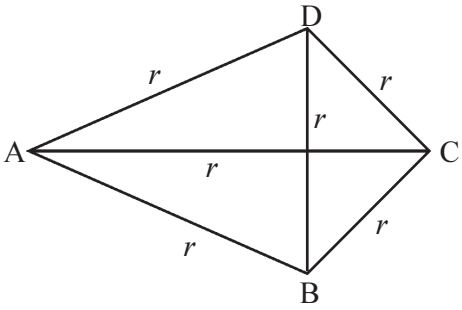
(111) In an experiment of a meter bridge, unknown resistance x Ω and resistance 12 Ω are connected with thin uniform wire of meter bridge. After connecting electrical components properly, the null point is obtained with jocky key at distance 60 cm from point A on AB wire, then value of unknown resistance will be _____. (Positive terminal of battery is connected with A)

(A) 18 Ω (B) 8 Ω (C) 16 Ω (D) 4 Ω

(112) In the circuit of meterbridge, coil P and Q with small resistance are connected in two gaps. At that time, the null point in obtained with jockey key at 40 cm from the end of P. If 60 Ω resistance is connected parallel to Q, the null point is displaced by 20 cm then what will be resistance of P and Q ?

(A) 50 Ω and 75 Ω (B) 60 Ω and 30 Ω (C) 20 Ω and 40 Ω (D) 10 Ω and 50 Ω

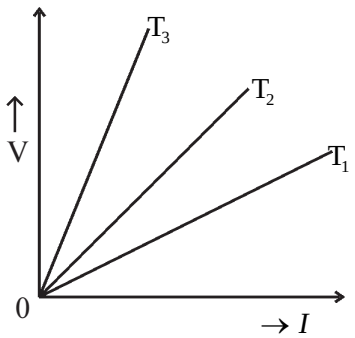
(113) Six resistances each of value r are arranged as shown in the figure, then effective resistance between A and B will be _____.



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

(C) r (D) $\frac{r}{2}$

(114) For any conductor, $V \rightarrow I$ graphs at different temperatures are as shown in figure, then _____.



(A) $T_1 < T_2 < T_3$ (B) $T_1 = T_2 = T_3$

(C) $T_1 > T_2 > T_3$ (D) $T_2 = \frac{T_1 + T_3}{2}$

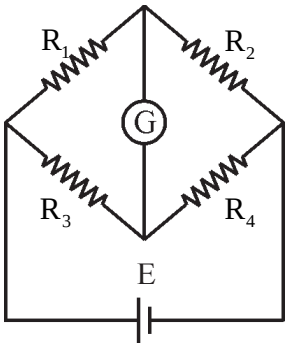
(115) In an experiment of meter bridge, when resistance P is balanced by Q, the null point from one end of wire is obtained at distance 20 cm. If $P < Q$ and 4P is balanced with Q then the null point will be at distance _____.

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

(116) The resistances of four branches P, Q, R, and S of a wheatstone bridge are $10\ \Omega$, $30\ \Omega$, $20\ \Omega$ and $60\ \Omega$ respectively. The emf and internal resistance of cell are 5 V and $2\ \Omega$ respectively. If resistance of galvenometer is $60\ \Omega$ then current drawn from the cell will be _____.

(A) 2 A (B) 0.2 A (C) 0.15 A (D) 0.174 A

(117) In the circuit of wheatstone bridge, different resistances are connected as shown in figure. Current flowing through galvanometer is zero. If heating effect are neglected then in which following condition, the current through galvanometer will not be zero ?



(A) emf of cell is doubled

(B) Exchanging battery and galvenometer

(C) Resistances of circuit are doubled

(D) Interchanging resistances R_1 and R_2

(118) In the circuit of potentiometer, the null point is obtained at distance 35 cm when a cell of 1.25 V is connected. If the cell is changed, the null point displaces to distance 63 cm then emf of second cell will be _____.

(A) 1.75 V (B) 2 V (C) 2.25 V (D) 2.5 V

(119) In an experiment of potentiometer, the null point is obtained at 250 cm for one cell. If parallel to this cell, a $2\ \Omega$ resistance is connected then the null point is obtained at 125 cm, then the internal resistance of cell will be _____.

(A) $2\ \Omega$ (B) $4\ \Omega$ (C) $0.5\ \Omega$ (D) $1\ \Omega$

(120) A wire of length 10 m is connected with steady voltage source of potentiometer. When primary cell connected with it is in open circuit condition, the null point is obtained at 7.8 m. When current is flowing through primary cell and resistance of $10\ \Omega$ connected with it, the null point is obtained at distance 7 m, then internal resistance of primary cell will be _____.

(A) $1.24\ \Omega$ (B) $1.36\ \Omega$ (C) $1.14\ \Omega$ (D) $1\ \Omega$

(121) The resistance and length of potentiometer wire are $10\ \Omega$ and 100 cm in an experiment of potentiometer. A cell of 2 V emf with negligible internal resistance and resistance R are connected in series with it. If null point is obtained at length 40 *cm* for a voltage source of 10 *m*V emf then value of resistance R will be _____.

(A) $900\ \Omega$ (B) $820\ \Omega$ (C) $790\ \Omega$ (D) $670\ \Omega$

(122) A battery of emf 2 V and internal resistance $1\,\Omega$ is connected with the potentiometer of length 200 cm and resistance $4\,\Omega$ and electric current is passed then the potential gradient will be _____.

(A) 8×10^{-3} Vcm^{-1} (B) 4×10^{-3} Vcm^{-1} (C) 6×10^{-3} Vcm^{-1} (D) 2×10^{-3} Vcm^{-1}

(123) A steady voltage source is connected with potentiometer wire of length 4 m. The null point is obtained at distance 1 m for Leclanche cell. If length of potentiometer wire is increased by 1 m then for the same Lenchanche cell, the null point will be obtained at _____.

(A) 1.25 cm (B) 1.4 m (C) 1.75 m (D) 1.2 m

(124) Resistance of potentiometer wire of length 15 m is $30\,\Omega$. It is connected in series with 5 V battery and $20\,\Omega$ resistance, then the potential difference between two point seperated by 40 cm on the wire will be _____.

(A) 0.02 V (B) 0.06 V (C) 0.08 V (D) 0.1 V

Ans. : 101 (A), 102 (A), 103 (B), 104 (B), 105 (C), 106 (D), 107 (B), 108 (A), 109 (D), 110 (A), 111 (B), 112 (A), 113 (D), 114 (A), 115 (A), 116 (D), 117 (D), 118 (C), 119 (A), 120 (C), 121 (C), 122 (A), 123 (A), 124 (C)

Comprehension Type Questions :

Passage I :

In an experiment, the current flowing through a cell and potential difference across it's terminal are measured and following observation table is prepared.

S.No.	V (volt)	I (Ampere)
1.	1.2	0.04
2.	0.8	0.12
3.	0.4	0.20

(125) What is the emf of cell used in experiment ?

(A) 1.5 V (B) 1.4 V (C) 2 V (D) 2.5 V

(126) What will be the maximum current that can be withdrawn from cell ?

(A) 0.25 A (B) 0.28 A (C) 0.3 A (D) 0.35 A

(127) What will be maximum power can be withdrawn from cell ?

(A) 50 mW (B) 98 mW (C) 9.8 mW (D) 49 mW

Passage II :

A battery of emf 14 V and internal resistance $1\,\Omega$ is connected with another battery of emf 20 V and internal resistance $2\,\Omega$ in opposing mode and circuit is completed. Find the following quantities in this condition.

(128) Current flowing in circuit.

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

(129) Electric power in both batteries

(A) 14 W, 20 W (B) 15 W, 10 W (C) 30 W, 45 W (D) 28 W, 40 W

(130) Terminal voltage of both batteries

(A) 12 V, 24 V (B) 15 V, 20 V (C) 10 V, 30 V (D) 8 V, 12 V

(131) Electric power consumed in both batteries.

(A) 8 W, 4 W (B) 4 W, 8 W (C) 5 W, 10 W (D) 6 W, 9 W

(132) Bulbs A and B have ratings 40 W, 110 V and 100 W, 110 V respectively, then find the resistances of their filament.

(A) $120\,\Omega, 250\,\Omega$ (B) $302.5\,\Omega, 121\,\Omega$

(C) $100\,\Omega, 110\,\Omega$ (D) $25\,\Omega, 60\,\Omega$

(133) If above two bulbs are connected in series with supply of 220 V then which bulb will be fused ?

(A) Bulb A (B) Bulb B

(C) Both A and B (D) No one will be fused

Ans. : 125 (B), 126 (B), 127 (B), 128 (C), 129 (D), 130 (A), 131 (B), 132 (B), 133 (A)

Assertion - Reason type Question :

Instruction : Read assertion and reason carefully, select proper option from given below.

(a) Both assertion and reason are true and reason explains the assertion.

(b) Both assertion and reason are true but reason does not explain the assertion.

(c) Assertion is true but reason is false.

(d) Assertion is false and reason is true.

---

(134) **Assertion :** As temperature is increased, the drift volecity of electrons in metal decreases.

Reason : If temperature is increased, the conductivity of metal decreases.

(A) a (B) b (C) c (D) d

(135) **Assertion :** When Wheatstone bridge is in balanced condition $R_{AC} = \dfrac{(P+Q)(R+S)}{(P+Q+R+S)}$

Reason : Points B and D are at same electric potential.

(A) a (B) b (C) c (D) d

(136) **Assertion :** Two bulbs of 60 W and 200 W are given. When they are conected in series, bulb of 60 W glow more bright and when connected in parallel, 200 W bulb glow more bright.

Reason : In series connection, power directly proportional to resistance and in parallel connection, power inversly proportional to resistance.

(A) a (B) b (C) c (D) d

(137) **Assertion :** The ratio of resultant resistance of two resistors of same resistance when first connected in series and then connected in parallel is 4:1.

Reason : In series connection, resistancce increases and in parallel connection, the resistance decreases

(A) a (B) b (C) c (D) d

(138) **Assertion :** The resistance of fuse wire is more and it's melting point is high.

Reason : Fuse wire is used for small electric current only.

(A) a (B) b (C) c (D) d

(139) **Assertion :** Voltmeter measures terminal voltage (V) of battery, not it's emf (ε)

Reason : When voltmeter is connected with battery, electric current passes through battery.

(A) a (B) b (C) c (D) d

(140) **Assertion :** For semi conductors, as temperature is increased, their resistivity decreases.

Reason : Semiconductors obey Ohm's law.

(A) a (B) b (C) c (D) d

Ans. : 134 (B), 135 (B), 136 (A), 137 (B), 138 (D), 139 (A), 140 (C)

Matching type Questions :

(141)

Column-1		Column-2	
(a)	Resistivity	(p)	$M^{-1} L^{o} T^{-2} A^{1}$
(b)	Mobility	(q)	$M^{1} L^{2} T^{-3}$
(c)	Electomotive force	(r)	$M^{1} L^{3} T^{-3} A^{-2}$
(d)	Electric Power	(s)	$M^{1} L^{2} T^{-3} A^{-1}$

(A) a (r), b (p), c (s), d (q)
(B) a (p), b (q), c (r), d (s)
(C) a (q), b (r), c (s), d (p)
(D) a (s), b (p), c (q), d (r)

(142)

Column-1		Column-2	
(a)	Kirchoff's first law	(p)	$\sum IR = \sum \varepsilon$
(b)	Wheatstone bridge	(q)	$\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$
(c)	Kirchoff's second law	(r)	$\sum I = 0$
(d)	Potentiometer	(s)	$\frac{R_1}{R_2} = \frac{R_3}{R_4}$

(A) a (s), b (q), c (r), d (p)
(B) a (p), b (r), c (q), d (s)
(C) a (q), b (p), c (r), d (s)
(D) a (r), b (s), c (p), d (q)

Ans. : 141 (A), 142 (D)