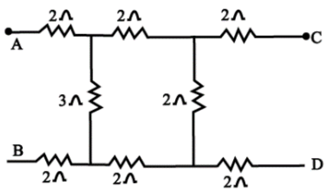
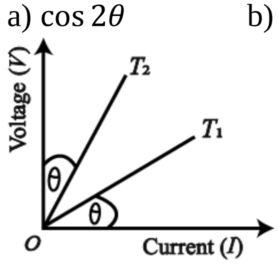
Current Electricity

1. Two conductors have the same resistance at 0°C but their temperature coefficients of resistance are α_1 and α_2 respectively. The temperature coefficient of their series combination is
   a) $\alpha_1 + \alpha_2$ b) $\frac{\alpha_1+\alpha_2}{2}$ c) $\alpha_1 - \alpha_2$ d) $\frac{\alpha_1-\alpha_2}{2}$
2. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metals respectively, the effective conductivity of the combination is
   a) $\sigma_1 + \sigma_2$ b) $\frac{\sigma_1+\sigma_2}{2}$ c) $\sqrt{\sigma_1\sigma_2}$ d) $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$
3. The effective resistance between A & B in the given circuit is



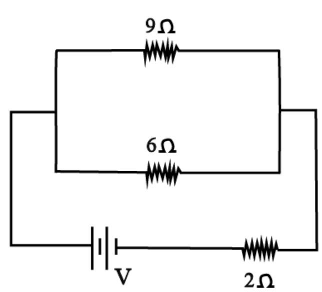
   a) 7Ω b) 2Ω 3) 7Ω d) 5Ω
4. The resistance of a 10 m long wire is 10Ω. Its length is increased by 25% by stretching the wire uniformly. Then the resistance of the wire will be
   a) 12.5 Ω b) 14.5 Ω c) 15.6 Ω d) 16.6 Ω
5. A nichrome wire 50 cm long and 1 mm^2 in cross-section carries a current of 4 A when connected to a 2 V storage battery. The resistivity of nichrome is
   a) 1×10^{-6} Ω m b) 2×10^{-7} Ω m
   c) 4×10^{-7} Ω m d) 5×10^{-7} Ω m
6. The drift velocity of the electrons in a conductor is v when a current I is flowering in it. If both the radius and current are doubled, then drift velocity will be
   a) v b) $\frac{v}{2}$ c) $\frac{v}{4}$ d) $\frac{v}{8}$
7. The $V - I$ graph for a conductor at temperature T_1 and T_2 are as shown in the figure. The term $(T_1 - T_2)$ is proportional to
   a) $\cos 2\theta$ b) $\sin 2\theta$ c) $\cot 2\theta$ d) $\tan 2\theta$



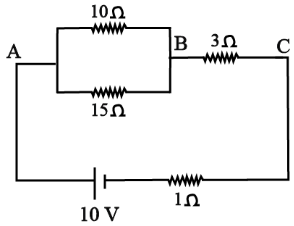
8. In a closed circuit, the current I (in ampere) at an instant of time t (in seconds) is given by $I = 4 - 0.08t$. The number of electrons flowing in the time interval of $t = 0$ to $t = 50$s through the cross-section of the conductor is
   a) 1.25×10^{19} b) 6.25×10^{20}
   c) 5.25×10^{19} d) 2.55×10^{20}
9. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is
   a) drift velocity b) electric field
   c) current density d) current

10. 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 27.0 ^oC? Temperature coefficient of resistance of nichrome averaged over the temperature range involved is $1.70\times10^{-4}\ ^oC^{-1}$.
11. The masses of three wires of copper are in the ratio 1 : 3 : 5 and lengths are in the ratio 5 : 3 : 1. Then the ratio of their electrical resistances are
    a) 1 : 3 : 5 b) 5 : 3 : 1
    c) 1 : 15 : 25 d) 125 : 15 : 1
12. A heating element has a resistance of 100 Ω at room temperature. When it is connected to a supply of 220 V, a steady current of 2A passes in it and temperature is 500^{o}C more than room temperature. What is the temperature coefficient of resistance of the heating element?
    a) $1\times10^{-4}\ {}^\circ C^{-1}$ b) $5\times10^{-4}\ {}^\circ C^{-1}$
    c) $2\times10^{-4}\ {}^\circ C^{-1}$ d) $0.5\times10^{-4}\ {}^\circ C^{-1}$
13. A metal wire of resistance 3 Ω is elongated to make a uniform wire of double its previous length. This new wire is now bent and the ends joined to make a circle. If two points on this circle make an angle 60^o at the centre, the equivalent resistance between these two points will be:
    a) $\frac{12}{5}\Omega$ b) $\frac{5}{3}\Omega$ c) $\frac{5}{2}\Omega$ d) $\frac{7}{2}\Omega$
14. When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5×10^{-4} ms^{1}. If the electron density in the wire is 8×10^{28} m^{-3}, the resistivity of the material is close to
    a) $1.6\times10^{-8}\Omega m$ b) $1.6\times10^{-7}\Omega m$
    c) $1.6\times10^{-6}\Omega m$ d) $1.6\times10^{-5}\Omega m$

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

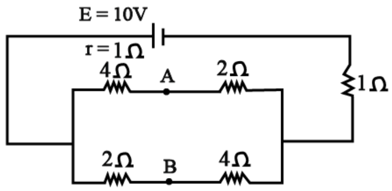


    a) 2 V b) 4 V c) 8 V d) 10 V
16. A circuit is as shown in the figure. Then, the current from A to B is
    a) +500 mA b) + 250 mA c) −250 mA d) −500 mA
17.



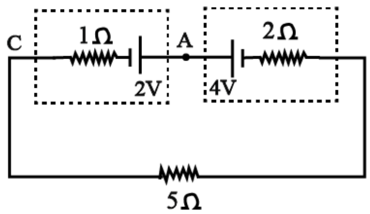
In the network shown in the above figure, find the current through 3Ω and 10 Ω resistances

18. In the circuit shown below, the cell has an emf of 10V and internal resistance of 1 ohm. The other resistances are shown in the figure. The potential difference $V_A - V_B$ is



a) 6V b) 4V c) 2V d) -2V

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



a) 1.75 V b) 2.25 V c) $\frac{5}{4}$V d) $\frac{4}{5}$V

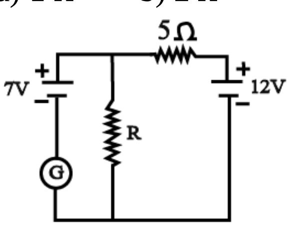
20. Two cells of emf E each and internal resistance r_1 *and* r_2 are connected in series across a road resistance R. If potential difference across the first cell is zero, then find the relation between R. r_1 and r_2.

21. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

a) 10 b) 11 c) 9 d) 20

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

a) 1 Ω b) 2 Ω c) 5 Ω d) 7 Ω



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

a) 4.2 min b) 6.3 min c) 8.4 min d) 12.6 min

24. A hollow copper cylinder is of inner radius 4 cm and outer radius 5cm. now hollow portion is completely filled with suitable copper wires. Find percentage change in its electric resistance.

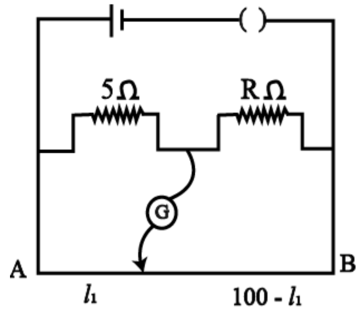
25. To get maximum current through a resistance of 2.5 Ω, one can use m rows of cells, each row having n cells. The internal resistance of each cell is 0.5 Ω. What are the values of n and m, if the total number of cells is 45?

a) $m = 3, n = 15$ b) $m = 5, n = 9$
c) $m = 9, n = 5$ d) $m = 15, n = 3$

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

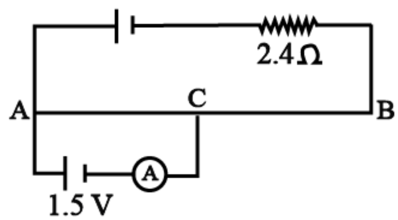
a) 37.5 W b) 25 W c) 12.5 W d) 10 W

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

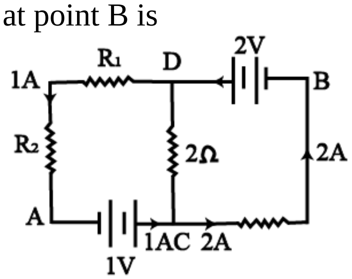


a) 10 Ω b) 15 Ω c) 20 Ω d) 25 Ω

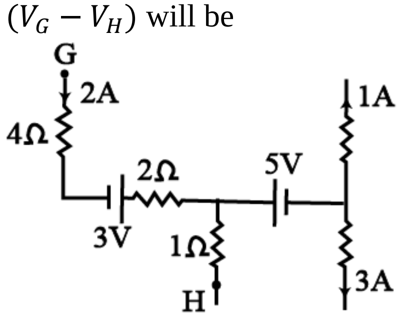
28. A simple potentiometer circuit in the figure. The internal resistance of the 4 V battery is negligible. AB is a uniform wire of length 100 cm and resistance 2Ω. What would be the length AC for zero galvanometer deflection?



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

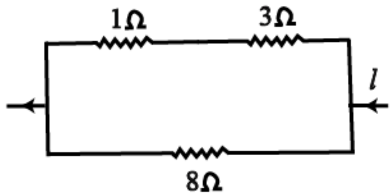


30. In the part of a circuit shown in figure, the potential difference between points G and H $(V_G - V_H)$ will be



a) 0V b) 12V c) 7V d) 3V

31. The potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the cases. The ratio of emf's is
a) 3 : 2 b) 5 : 1 c) 5 : 4 d) 3 : 4
32. A rise of temperature of 4°C is observed in a conductor by passing a current. If the current is tripled, the rise of temperature will be
a) 8°C b) 12°C c) 16°C d) 36°C
33. Two electric bulbs marked 40 W, 220 V and 60 W, 220 V when connected in series, across same voltage supply of 220 V, the effective power is P_1 and when connected in parallel, the effective power is P_2. Then $\frac{P_1}{P_2}$ is
a) 0.5 b) 0.48 c) 0.24 d) 0.16
34. An electric bulb rated 500 W at 100 V is used in a circuit having a 200 V supply. The resistance R that must be put in series with the bulb, so that the bulb draws 500 W is
a) 10 Ω b) 15 Ω c) 20 Ω d) 25 Ω
35. A potentiometer wire of length 100 cm has a resistance of 10 Ω. It is connected in series with a resistance and an accumulator of EMF 2 V and negligible internal resistance. A source of EMF 10 mV is balanced against a length of 40 cm of the potentiometer wire. What is the value of the external resistance?
36. 12 cells, each having emf E volts are connected in series and kept in a closed box. Some of these cells are wrongly connected with positive and negative terminals reversed. This 12 cells battery is connected in series with an ammeter, an external resistance R ohm and a 2 cell battery (two cells of the same type used earlier, connected perfectly in series). The current in the circuit when the 12 cell battery and 2 cell battery aid each other is 3A and is 2A when they oppose each other. Then, the number of cells in 12 cell battery that are connected wrongly is
a) 4 b) 3 c) 2 d) 1
37. Three resistances P, Q, R each of 2 Ω and an unknown resistance S form the four arms of an wheatstone bridge circuit. When a resistance of 6 Ω is connected in parallel to S the bridge gets balanced. What is the value of S?
a) 1 Ω b) 2 Ω c) 3 Ω d) 6 Ω
38. A potentiometer wire has length 4 m and resistance 8 Ω. The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2 V, so as to get a potential gradient 1 mV per cm on the wire is
a) 48 Ω b) 32 Ω c) 40 Ω d) 44 Ω
39. Resistors P and Q connected in the gaps of the meter bridge. The balancing point is obtained $\frac{1}{3}$ m from the zero end. If a 6 Ω resistance is connected in series with P, the balanced point shifts to $\frac{2}{3}$ m from same end. P and Q are
a) 4, 2 b) 2, 4 c) both (a) and (b) d) neither (a) nor (b)
40. Two rods are joined end to end. Both have a cross-sectional area of 0.01 cm^2. Each is 1 meter long. One rod is a copper with a resistivity of 1.7×10^{-6} ohm-centimeter, the other is of iron with a resistivity of 10^{-5} ohm-centimeter.
How much voltage is required to produce a current of 1 ampere in the rods?
41. Power dissipated across the 8 Ω resistor in the circuit shown here is 2 W. the power dissipated in watt units across the 3 Ω resistor is



a) 2 b) 1 c) 0.5 d) 3

42. A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is

a) 1 b) 2 c) 3 d) 4

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

a) $-r$ and ε b) r and $-\varepsilon$ c) $-\varepsilon$ and r d) $-\varepsilon$ and $-r$

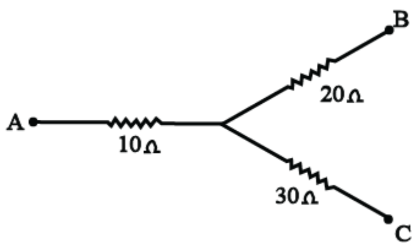
44. A cell can be balanced against 110 cm and 100 cm of potentiometer wire, respectively with and without being short circuited through a resistance of 10 Ω its internal resistance is

a) zero b) 1 Ω c) 0.5 Ω d) 2 Ω

45. In a house 15 bulbs of 45 W, 15 bulbs of 100 W, 15 bulbs of 10 W and two heaters of 1 KW each is connected to 220 V mains supply then find minimum fuse current

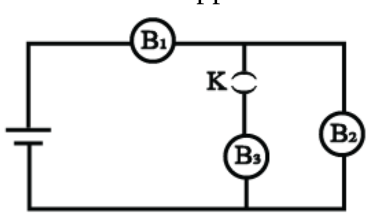
a) 5A b) 20 A c) 25 A d) 15 A

46. In the circuit given here, the points A, B and C are 70 V, zero, 10 V respectively



a) Currents in the paths AD, DB and DC are in the ratio of 1 : 2 : 3.
b) Currents in the paths AB, DB and DC are in the ratio of 3 : 2 : 1
c) The point D will be at a potential of 60 V.
d) The point D will be at a potential of 20 V

47. B_1, B_2 and B_3 are the three identical bulbs connected to a battery of steady e.m.f with key K closed. What happens to the brightness of the bulbs B_1 and B_2 when the key is opened?



a) Brightness of the bulb, B_1 decreases and that of B_2 increases
b) Brightness of the bulbs B_1 and B_2 decreases
c) Brightness of the bulbs B_1 increases and that of B_2 decreases
d) Brightness of the bulbs B_1 and B_2 increases.