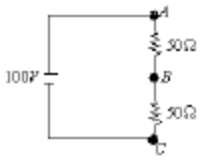
INDIAN SCHOOL MUSCAT

DEPARTMENT OF PHYSICS

STUDY MATERIAL FOR NEET AND JEE EXAMS

Current Electricity

1. **In the circuit shown below, a voltmeter of internal resistance R, when connected across B and C reads 100/3 volts. Neglecting the internal resistance of the battery, the value of R is**

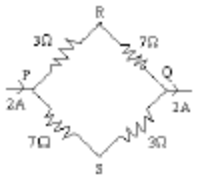


1) $100k\Omega$ 2) $75k\Omega$ 3) $50k\Omega$ 4) $25k\Omega$

2. **A cell in secondary circuit gives null deflection for 2.5 m length of potentiometer having 10m length of wire. If the length of the potentiometer wire is increased by 1m without changing the cell in the primary, the position of the null point now is:**

1) 3.5m 2) 3m 3) 2.75m 4) 2.0m

3. **A current of 2 A flows in an electric circuit as shown in figure. The potential difference $(V_R - V_S)m$ in volts (V_R and V_S are potentials at R and S respectively) is**



1) – 4 (2) + 2 (3) + 4 (4) – 2

4. **When a battery connected across a resistor of 16Ω, the voltage across the resistor is 12 V. When the same battery is connected across a resistor of 10Ω, voltage across it is 11 V. The internal resistance of the battery in Ohms is**

(1) $\frac{10}{7}$ (2) $\frac{20}{7}$ (3) $\frac{25}{7}$ (4) $\frac{30}{7}$

5. **Two unknown resistance X and Y are connected to left and right gaps of a meter bridge and the balancing point is obtained at 80 cm from left. When a 10Ω resistance is connected in parallel to X, the balancing point is 50 cm from left. The values of X and Y respectively are**

(1) 40Ω, 9Ω (2) 30Ω, 7.5Ω (3) 20Ω, 6Ω (4) 10 Ω, 3Ω

6. **The current in a circuit containing a battery connected to 2Ω resistance is 0.9 A. When a resistance of 7Ω connected to the same battery, the current observed in the circuit is 0.3A. Then the internal resistance of the battery is**

(1) 0.1 Ω (2) 0.5 Ω (3) 1 Ω (4) Zero

7. **One end each of a resistance 'r' capacitance C and resistance '2r' are connected together. The other ends are respectively connected to the positive terminals of the batteries P, Q, R having respectively e.m.f. s E, E and 2E. The negative terminals of the batteries are then connected together. In this circuit, with steady current the potential drop across the capacitance is:**

1) $\frac{E}{3}$ 2) $\frac{E}{2}$ 3) $\frac{2E}{3}$ 4) E

8. **Twelve cells, each having e.m.f. 'E' volts are connected in series and are kept in a closed box. Some of these cells are wrongly connected with positive and negative terminals reversed. This 12 cell battery is connected in series with an ammeter, an external resistance 'R' ohms and a two-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. Then the number of cells in 12-cells battery that are connected wrongly is**

1) 4 2) 3 3) 2 4) 1

10. **In a meter bridge a resistance is connected in the left gap and a pair of resistances P and Q in the right gap. Measured from the left, the balance point is 37.5 cm when P and Q are in series and 71.4 cm when they are parallel. The values of P and Q (in) are**

1) 40; 10 2) 35; 15 3) 30; 20 4) 25; 25

11. **'n' conducting wires of same dimensions but having resistivities 1, 2, 3,...n are connected in series. The equivalent resistivity of the combination is**

1) $\frac{n(n+1)}{2}$ 2) $\frac{n+1}{2}$ 3) $\frac{n+1}{2n}$ 4) $\frac{2n}{n+1}$

12. **Two cells A and B are connected in the secondary circuit of a potentiometer one at a time and the balancing length are respectively 400cm and 440 cm. The e.m.f. of the cell A is 1.08 volt. The e.m.f. of the second cell B in volts is**

1) 1.08 2) 1.188 3) 11.88 4) 12.8

13. **In a potentiometer experiment, the balancing length with a cell is 560 cm. When an external resistance of 10 ohm is connected in parallel to the cell the balancing length changes by 60cm. The internal resistance of the cell in ohms is**

1) 3.6 2) 2.4 3) 1.2 4) 0.6

14. **Two resistances of 400Ω and 800Ω 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 400Ω. The error in the measurement of potential difference in volt approximately is**

1) 0.01 2) 0.02 3) 0.03 4) 0.05

15. **The balancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of 10 is connected in parallel to the cell the balancing length changes by 60 cm. The internal resistance of the cell in ohms is**

1) 1.6 2) 1.4 3) 1.2 4) 0.12

16. **A conductor of resistance 3 ohm is stretched uniformly till its length is doubled. The wire now is bent in the form of an equilateral triangle. The effective resistance between the ends of any side of the triangle in ohms is**

1) $\frac{9}{2}$ 2) $\frac{8}{3}$ 3) 2 4) 1

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

1) R 2) $\frac{R}{2}$ 3) $\frac{101R}{200}$ 4) $\frac{201R}{200}$

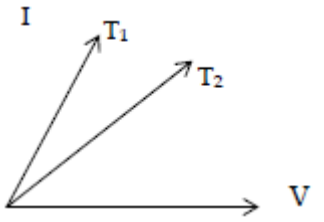
18. **Two wires of equal diameters, of resistivities ρ_1, ρ_2 and lengths x_1 and x_2 respectively are joined in series. The equivalent resistivity of the combination is**

1) $\frac{\rho_1 x_1 + \rho_2 x_2}{x_1 + x_2}$ 2) $\frac{\rho_1 x_2 - \rho_2 x_1}{x_1 - x_2}$ 3) $\frac{\rho_1 x_2 + \rho_2 x_1}{x_1 + x_2}$ 4) $\frac{\rho_1 x_1 - \rho_2 x_2}{x_1 - x_2}$

19. **A flash light lamp is marked 3.5V and 0.28A. The filament temperature is 425^0C. The filament resistance of 0^0C is 4Ω. Then, the temperature coefficient of resistance of the material of the filament is:**

1) $8.5\times10^{-3}/K$ 2) $3.5\times10^{-3}/K$ 3) $0.5\times10^{-3}/K$ 4) $5\times10^{-3}/K$

20. I and V are respectively the current and voltage in a metal wire of resistance 'R'. Two I-V graphs at two different temperatures T_1 and T_2 are given in the graph. Then



(1) $T_1 = T_2$ (2) $T_1 > T_2$ (3) $T_1 < T_2$ (4) $T_1 = 2T_2$

21. A projector lamp can be used at a maximum voltage of 60 V, its resistance is 20 Ω, the series resistance (in ohms) required to operate the lamp from a 75 V supply is

(1) 2 (2) 3 (3) 4 (4) 5

22. A teacher asked a student to connect 'N' cells each of e.m.f. 'e' in series to get a total e.m.f. of Ne. While connecting, the student, by mistake, reversed the polarity of 'n' cells. The total e.m.f. of the resulting series combination is

1) $e\left(N-\frac{n}{2}\right)$ 2) $e(N-n)$ 3) $e(N-2n)$ 4) eN

23. Two wires A and B, made of same material and having their lengths in the ratio 6 : 1 are connected in series. The potential differences across the wires are 3V and 2V respectively. If r_A and r_B radii of A and B respectively then $\frac{r_B}{r_A}$ is

1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) 1 4) 2

24. For a chosen non-zero value of voltage, there can be more than one value of current in

1) Copper wire 2) Thermistor 3) Zener diode 4) Manganine wire

25. **The temperature coefficient resistivity of a material is 0.0004/K. When the temperature of the material is increased by 50° C, its resistivity increases by 2 $\times 10^{-8}$ ohm-meter. The initial resistivity of the material in ohm-meter is**

1) 50×10^{-8} 2) 90×10^{-8} 3) 100×10^{-8} 4) 200×10^{-8}

26. **Two cells with the same EMF 'E" and different internal resistances r_1 and r_2 are connected in series to an external resistance R. The value of R so that the potential difference across the first cell be zero is**

1) $\sqrt{r_1r_2}$ 2) r_1+r_2 3) $r_1 - r_2$ 3) $\frac{r_1+r_2}{2}$

27. **Three unequal resistors in parallel are equivalent to a resistance 1 ohm. If two of them are in the ratio 1: 2 and if no resistance value is fractional, the largest of the three resistances in ohms is**

1) 4 2) 6 3) 8 4) 12

28. **In potentiometer experiment a cell of e.m.f. 1.5 V connected in the secondary circuit gives a balancing length of 165cm of the wire. If a resistance of 5 is connected parallel to the cell, the balancing length of the wire is 150cm. The internal resistance of the cell is**

1) 5 2) 1.5 3) 1 4) 0.5

29. **The sides of a rectangular block are 2cm, 3cm and 4cm. The ratio of the maximum to minimum resistance between its parallel faces is**

1) 4 2) 3 3) 2 4) 1

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

1) $\frac{1}{8}$ 2) $\frac{1}{7}$ 3) $\frac{1}{5}$ 4) $\frac{1}{3}$

31. **An ideal battery of emf 2V and a series resistance R are connected in the primary circuit of a potentiometer of length 1m and resistance 5Ω. The value of R to give a potential difference of 5mV across the 10cm of potentiometer wire is**

1) 180Ω 2) 190Ω 3) 195Ω 4) 200Ω

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

1) 1×10^{-6} 2) 4×10^{-7} 3) 3×10^{-7} 4) 2×10^{-7}

33. **When a resistor of 11Ω is connected in series with an electric cell, the current flowing in it is 0.5A. Instead when a resistor of 5Ω is connected to the same electric cell in series the current increases by 0.4A. The internal resistance of the cell is**

1) 1.5 2) 2 3) 2.5 4) 3.5

34. **Four resistances 10, 5, 7 and 3 are connected so that they form the sides of a rectangle AB, BC, CD and DA respectively. Another resistance of 10 is connected across the diagonal AC. The equivalent resistance between A and B is**

1) 2 2) 5 3) 7 4) 10

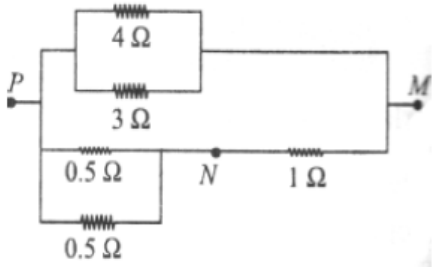
35. **In a meter bridge experiment, the ratio of the left gap resistance to right gap resistance is 2:3, the balance point from left is**

1) 60 cm 2) 50 cm 3) 40 cm 4) 20 cm

36. **An aluminium $\left[\rho = 2.2\times10^{-8}\Omega m\right]$ wire of a diameter 1.4 mm is used to make a 4Ω resistor. The length of the wire is**

1) 220m 2) 1000m 3) 280m 4) 1m

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



1) 0.5 volt 2) 3.2 volt 3) 1.5 volt 4) 1.0 volt

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

1) 2.0 ohm 2) Zero 3) 1.0 ohm 4) 0.5 ohm

40. **See the electrical circuit shown in the figure. Which of the following equations is a correction equation for it?**

1) $\varepsilon_2 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$ 2) $-\varepsilon_2 - (i_1+i_2)R + i_2r_2 = 0$

3) $\varepsilon_1 - (i_1+i_2)R + i_1r_1 = 0$ 4) $\varepsilon_1 - (i_1+i_2)R - i_1r_1 = 0$

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3) $\varepsilon_1 - (i_1+i_2)R + i_1r_1 = 0$ 4) $\varepsilon_1 - (i_1+i_2)R - i_1r_1 = 0$

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

1) 3Ω 2) $6\pi\Omega$ 3) 6Ω 4) $0.6\pi\Omega$

42. 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

1) –r and ε 2) r and $-\varepsilon$ 3) $-\varepsilon$ and r 4) ε and –r

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

1) 5×10^{-11} 2) 8×10^{-11} 3) 5×10^{7} 4) 8×10^{-7}

44. The important difference between manganin and nichrome is

1) Manganine is a metal and Nichrome is a non- metal

2) Temperature coefficient of resistance α is high for manganin and low for nichrome

3) α is low for manganin and high for nichrome

4) Nichrome is an alloy and Manganine is an element

45. The electric current passing through a metallic wire produces heat because

1) Collision conduction electrons with each other

2) Collision of atoms of the metal with each other

3) The energy released in the ionization of the atoms of the metal

4) Collision of conduction electrons with the atoms of the metallic wire

46. The number of electrons crossing per sec. Any section of a conductor carrying a current of 3.2 amp and normal to the direction of flow is

1) 3×10^{19} 2) 3.2×10^{19} 3) 10^{19} 4) 2×10^{19}

47. A metallic block has no potential difference applied across it. Then the mean velocity of a free electron is

1) Proportional to T 2) Proportional to $\sqrt{T}$

3) Zero 4) Finite but independent of temperature

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

1) More at larger area of cross-section 2) Same at any cross-section

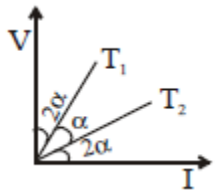
3) More at smaller area of cross-section 4) None of these

49. At absolute zero silver wire behaves as

1) Super Conductor 2) Semiconductor 3) Perfect Insulator 4) Semi Insulator

50.

The figure shows the variation of V with I at temperatures T_1 and T_2 $(T_1 - T_2)$ is proportional to



1) Tan2θ 2) Tanθ 3) Sinθ 4) Cos2θ