Current Electricity

1. Statement 1: The temperature dependence of resistance is usually given as $R = R_0(1 + \alpha\Delta t)$. The resistance of a wire changes from 100 Ω to 150 Ω when its temperature is increased from 27°C to 227°C. This implies that $\alpha = 2.5 \times 10^{-3}$/°C.

   Statement 2: $R = R_0(1 + \alpha\Delta t)$ is valid only when the change in the temperature ΔT is small and $\Delta R = (R - R_0) << R_0$. **[AIEEE-2009]**

   (1) Statement 1 is true, statement 2 is true; Statement 2 is the correct explanation of Statement 1

   (2) Statement 1 is true, Statement 2 is true; Statement 2 is not the correct explanation of Statement 1

   (3) Statement 1 is false, Statement 2 is true

   (4) Statement 1 is true, Statement 2 is false

2. Two conductors have the same resistance at 0°C but their temperature coefficients of resistance are α_1 and α_2. The respective temperature coefficients of their series and parallel combinations are nearly **[AIEEE-2010]**

   (1) $\frac{\alpha_1 + \alpha_2}{2}, \frac{\alpha_1 + \alpha_2}{2}$ (2) $\frac{\alpha_1 + \alpha_2}{2}, \alpha_1 + \alpha_2$

   (3) $\alpha_1 + \alpha_2, \frac{\alpha_1 + \alpha_2}{2}$ (4) $\alpha_1 + \alpha_2, \frac{\alpha_1\alpha_2}{\alpha_1 + \alpha_2}$

3. Combination of two identical capacitors, a resistor R and a dc voltage source of voltage 6 V is used in an experiment on a ($C - R$) circuit. It is found that for a parallel combination of the capacitor the time in which the voltage of the fully charged combination reduces to half its original voltage is 10 second. For series combination, the time needed for reducing the voltage of the fully charged series combination by half is **[AIEEE-2011]**

   (1) 2.5 second (2) 20 second

   (3) 10 second (4) 5 second

4. The current in the primary circuit of a potentiometer is 0.2 A. The specific resistance and cross-section of the potentiometer wire are 4×10^{-7} ohm metre and 8×10^{-7} m^2 respectively. The potential gradient will be equal to **[AIEEE-2011]**

   (1) 0.1 V/m (2) 0.2 V/m

   (3) 1 V/m (4) 0.5 V/m

5. If 400 Ω of resistance is made by adding four 100 Ω resistances of tolerance 5%, then the tolerance of the combination is **[AIEEE-2011]**

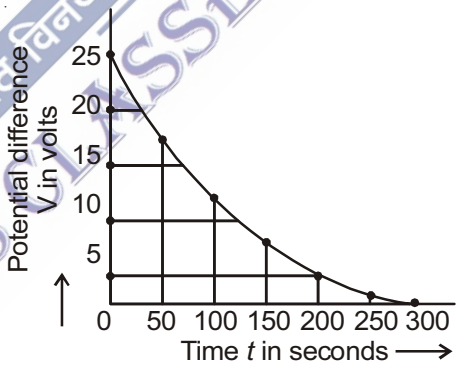
   (1) 15% (2) 20%

   (3) 5% (4) 10%

6. Two electric bulbs marked 25 W - 220 V and 100 W - 220 V are connected in series to a 440 V are connected in series to a 440V supply. Which of the bulbs will fuse? **[AIEEE-2012]**

   (1) 100 W (2) 25 W

   (3) Neither (4) Both

7. 

   The figure shows an experimental plot for discharging of a capacitor in an R-C circuit. The time constant τ of this circuit lies between **[AIEEE-2012]**

   (1) 0 and 50 s

   (2) 50 sec and 100 s

   (3) 100 sec and 150 s

   (4) 150 sec and 200 s

8. The supply voltage to a room is 120 V. The resistance of the lead wires is 6 Ω. A 60 W bulb is already switched on. What is the decrease of voltage across the bulb, when a 240 W heater is switched on in parallel to the bulb? **[JEE (Main)-2013]**

   (1) Zero (2) 2.9 volt

   (3) 13.3 volt (4) 10.04 volt

9. *This question has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements.*

Statement - I : Higher the range, greater is the resistance of ammeter.

Statement - II : To increase the range of ammeter, additional shunt needs to be used across it.

[JEE (Main)-2013]

(1) Statement - I is true, Statement - II is true, Statement - II is the correct explanation of Statement-I.

(2) Statement - I is true, Statement - II is true, Statement - II is not the correct explanation of Statement-I.

(3) Statement - I is true, Statement - II is false.

(4) Statement - I is false, Statement - II is true.

10. In a large building, there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be **[JEE (Main)-2014]**

(1) 8 A (2) 10 A

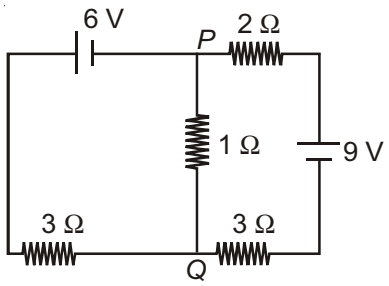
(3) 12 A (4) 14 A

11. When 5 V 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 **[JEE (Main)-2015]**

(1) 1.6×10^{-8} Ωm (2) 1.6×10^{-7} Ωm

(3) 1.6×10^{-6} Ωm (4) 1.6×10^{-5} Ωm

12. In the circuit shown, the current in the 1 Ω resistor is **[JEE (Main)-2015]**



(1) 1.3 A, from P to Q

(2) 0 A

(3) 0.13 A, from Q to P

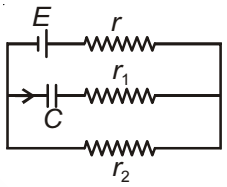
(4) 0.13 A, from P to Q

13. A galvanometer having a coil resistance of 100 Ω gives a full scale deflection, when a current of 1 mA is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of 10 A, is **[JEE (Main)-2016]**

(1) 2 Ω (2) 0.1 Ω

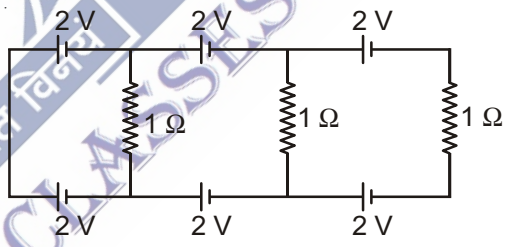
(3) 3 Ω (4) 0.01 Ω

14. In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance C will be **[JEE (Main)-2017]**



(1) CE (2) $CE\frac{r_1}{(r_2+r)}$

(3) $CE\frac{r_2}{(r+r_2)}$ (4) $CE\frac{r_1}{(r_1+r)}$

15. 

In the above circuit the current in each resistance is **[JEE (Main)-2017]**

(1) 1 A (2) 0.25 A

(3) 0.5 A (4) 0 A

16. When a current of 5 mA is passed through a galvanometer having a coil of resistance 15 Ω, it shows full scale deflection. The value of the resistance to be put in series with the galvanometer to convert it into a voltmeter of range 0-10 V is **[JEE (Main)-2017]**

(1) 1.985×10^3 Ω (2) 2.045×10^3 Ω

(3) 2.535×10^3 Ω (4) 4.005×10^3 Ω

17. Which of the following statements is false? **[JEE (Main)-2017]**

(1) Wheatstone bridge is the most sensitive when all the four resistances are of the same order of magnitude

(2) In a balanced Wheatstone bridge if the cell and the galvanometer are exchanged, the null point is disturbed

(3) A rheostat can be used as a potential divider

(4) Kirchhoff's second law represents energy conservation

18. Two batteries with e.m.f 12 V and 13 V are connected in parallel across a load resistor of 10 Ω. The internal resistances of the two batteries are 1 Ω and 2 Ω respectively. The voltage across the load lies between **[JEE (Main)-2018]**

(1) 11.6 V and 11.7 V

(2) 11.5 V and 11.6 V

(3) 11.4 V and 11.5 V

(4) 11.7 V and 11.8 V

19. In a potentiometer experiment, it is found that no current passes through the galvanometer when the terminals of the cell are connected across 52 cm of the potentiometer wire. If the cell is shunted by a resistance of 5 Ω, a balance is found when the cell is connected across 40 cm of the wire. Find the internal resistance of the cell. **[JEE (Main)-2018]**

(1) 1 Ω (2) 1.5 Ω

(3) 2 Ω (4) 2.5 Ω

20. On interchanging the resistances, the balance point of a meter bridge shifts to the left by 10 cm. The resistance of their series combination is 1 kΩ. How much was the resistance on the left slot before interchanging the resistances? **[JEE (Main)-2018]**

(1) 990 Ω (2) 505 Ω

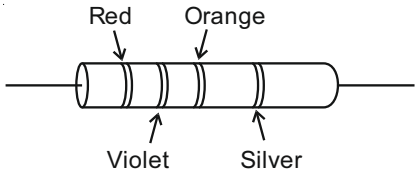
(3) 550 Ω (4) 910 Ω

21. A copper wire is stretched to make it 0.5% longer. The percentage change in its electrical resistance if its volume remains unchanged is **[JEE (Main)-2019]**

(1) 0.5% (2) 2.0%

(3) 2.5% (4) 1.0%

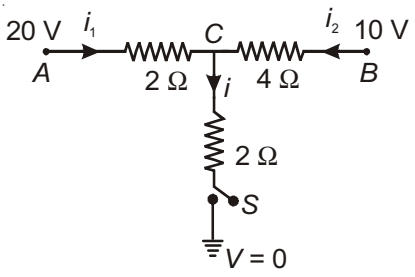
22. A resistance is shown in the figure. Its value and tolerance are given respectively by **[JEE (Main)-2019]**



(1) 27 kΩ, 20% (2) 270 Ω, 5%

(3) 27 kΩ, 10% (4) 270 Ω, 10%

23. When the switch *S*, in the circuit shown, is closed, then the value of current *i* will be **[JEE (Main)-2019]**



(1) 2 A (2) 5 A

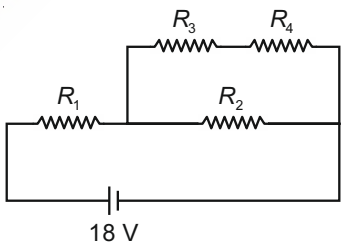
(3) 4 A (4) 3 A

24. A carbon resistance has a following colour code. What is the value of the resistance? **[JEE (Main)-2019]**

(1) 6.4 MΩ ± 5 % (2) 5.3 MΩ ± 5 %

(3) 64 kΩ ± 10 % (4) 530 kΩ ± 5 %

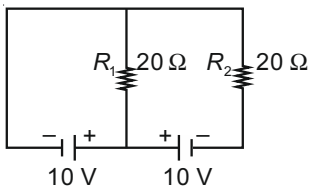
25. In the given circuit the internal resistance of the 18 V cells is negligible. If R_1 = 400 Ω, R_3 = 100 Ω and R_4 = 500 Ω and the reading of an ideal voltmeter across R_4 is 5 V, then the value of R_2 will be **[JEE (Main)-2019]**



(1) 230 Ω (2) 450 Ω

(3) 550 Ω (4) 300 Ω

26. In the given circuit the cells have zero internal resistance. The currents (in amperes) passing through resistance R_1 and R_2 respectively, are **[JEE (Main)-2019]**



(1) 1, 2 (2) 0, 1

(3) 0.5, 0 (4) 2, 2

27. A 2 W carbon resistor is color coded with green, black, red and brown respectively. The maximum current which can be passed through this resistor is **[JEE (Main)-2019]**

(1) 20 mA (2) 0.4 mA

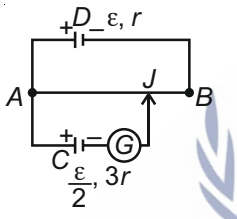
(3) 100 mA (4) 63 mA

28. A uniform metallic wire has a resistance of 18 Ω and is bent into an equilateral triangle. Then, the resistance between any two vertices of the triangle is **[JEE (Main)-2019]**

(1) 4 Ω (2) 12 Ω

(3) 8 Ω (4) 2 Ω

29. A potentiometer wire *AB* having length *L* and resistance 12*r* is joined to a cell *D* of emf ε and internal resistance *r*. A cell *C* having emf $\frac{\varepsilon}{2}$ and internal resistance 3*r* is connected. The length *AJ* at which the galvanometer as shown in fig. shows no deflection is **[JEE (Main)-2019]**



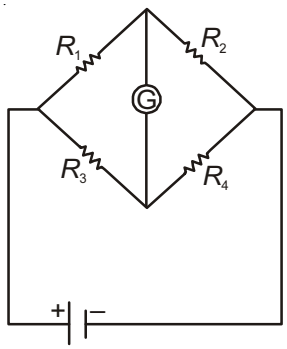
(1) $\frac{11}{12}L$ (2) $\frac{11}{24}L$

(3) $\frac{5}{12}L$ (4) $\frac{13}{24}L$

30. The Wheatstone bridge shown in Fig. here, gets balanced when the carbon resistor used as R_1 has the colour code (Orange, Red, Brown). The resistors R_2 and R_4 are 80 Ω and 40 Ω respectively.

Assuming that the colour code for the carbon resistors gives their accurate values, the colour code for the carbon resistor, used as R_3, would be

[JEE (Main)-2019]



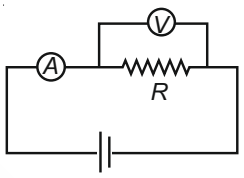
(1) Brown, Blue, Black

(2) Red, Green, Brown

(3) Grey, Black, Brown

(4) Brown, Blue, Brown

31. The actual value of resistance *R*, shown in the figure is 30 Ω. This is measured in an experiment as shown using the standard formula $R = \frac{V}{I}$, where *V* and I are the readings of the voltmeter and ammeter, respectively. If the measured value of *R* is 5% less, then the internal resistance of the voltmeter is **[JEE (Main)-2019]**



(1) 570 Ω (2) 600 Ω

(3) 350 Ω (4) 35 Ω

32. A current of 2 mA was passed through an unknown resistor which dissipated a power of 4.4 W. Dissipated power when an ideal power supply of 11 V is connected across it is **[JEE (Main)-2019]**

(1) 11×10^{-5} W (2) 11×10^{5} W

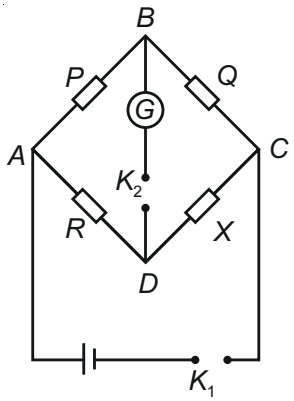
(3) 11×10^{-3} W (4) 11×10^{-4} W

33. Two equal resistances when connected in series to a battery, consume electric power of 60 W. If these resistances are now connected in parallel combination to the same battery, the electric power consumed will be **[JEE (Main)-2019]**

(1) 60 W (2) 30 W

(3) 120 W (4) 240 W

34. In a Wheatstone bridge (see fig.), Resistances *P* and *Q* are approximately equal. When *R* = 400 Ω, the bridge is balanced. On interchanging *P* and *Q*, the value of *R*, for balance, is 405 Ω. The value of *X* is close to **[JEE (Main)-2019]**

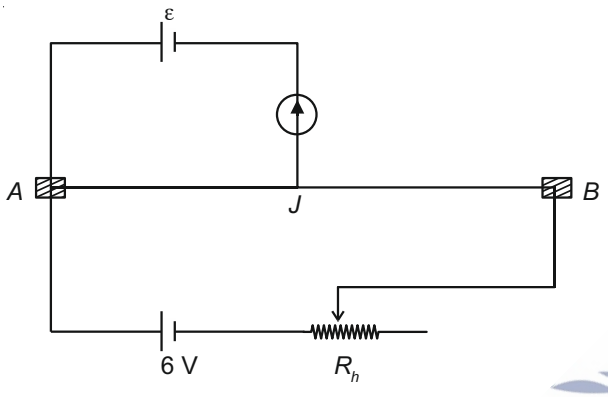


(1) 404.5 ohm (2) 401.5 ohm

(3) 402.5 ohm (4) 403.5 ohm

35. The resistance of the metre bridge *AB* in given figure is 4 Ω. With a cell of emf ε = 0.5 V and rheostat resistance R_h = 2 Ω the null point is obtained at some point *J*. When the cell is replaced by another one of emf ε = ε_2 the same null point *J* is found for R_h = 6 Ω.The emf ε_2 is

[JEE (Main)-2019]



(1) 0.6 V (2) 0.5 V

(3) 0.3 V (4) 0.4 V

36. A galvanometer having a resistance of 20 Ω and 30 divisions on both sides has figure of merit 0.005 ampere/division. The resistance that should be connected in series such that it can be used as a voltmeter upto 15 volt, is **[JEE (Main)-2019]**

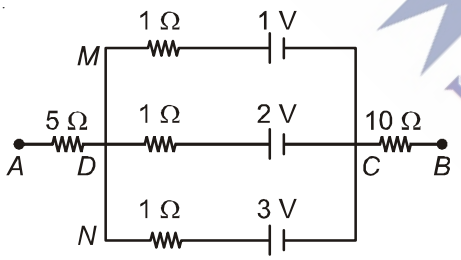
(1) 100 Ω

(2) 125 Ω

(3) 80 Ω

(4) 120 Ω

37. In the circuit shown, the potential difference between *A* and *B* is **[JEE (Main)-2019]**

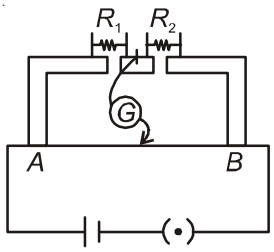


(1) 6 V (2) 3 V

(3) 2 V (4) 1 V

38. In the experimental set up of metre bridge shown in the figure, the null point is obtained at a distance of 40 cm from *A*. If a 10 Ω resistor is connected in series with R_1, the null point shifts by 10 cm. The resistance that should be connected in parallel with (R_1 + 10) Ω such that the null point shifts back to its initial position is

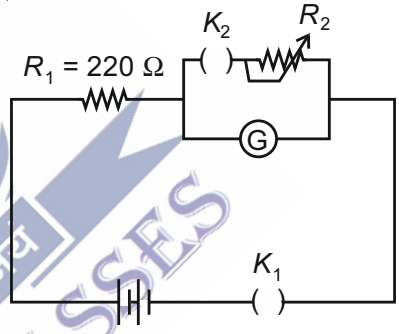
[JEE (Main)-2019]



(1) 60 Ω (2) 30 Ω

(3) 40 Ω (4) 20 Ω

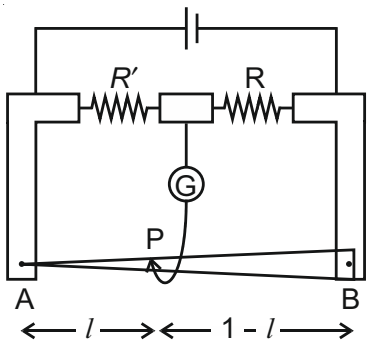
39. The galvanometer deflection, when key K_1 is closed but K_2 is open, equal θ_0 (see figure). On closing K_2 also and adjusting R_2 to 5 Ω, the deflection in galvanometer becomes $\frac{\theta_0}{5}$. The resistance of the galvanometer is, then given by [Neglect the internal resistance of battery] **[JEE (Main)-2019]**



(1) 22 Ω (2) 25 Ω

(3) 5 Ω (4) 12 Ω

40. In a meter bridge, the wire of length 1 m has a non-uniform cross-section such that, the variation $\frac{dR}{dl}$ of its resistance *R* with length *l* is $\frac{dR}{dl} \propto \frac{1}{\sqrt{l}}$. Two equal resistances are connected as shown in the figure. The galvanometer has zero deflection when the jockey is at point *P*. What is the length *AP* ? **[JEE (Main)-2019]**



(1) 0.2 m (2) 0.35 m

(3) 0.25 m (4) 0.3 m

41. An ideal battery of 4 V and resistance R are connected in series in the primary circuit of a potentiometer of length 1 m and resistance 5 Ω. The value of R, to give an potential difference of 5 mV across 10 cm of potentiometer wire, is **[JEE (Main)-2019]**

(1) 480 Ω (2) 490 Ω

(3) 495 Ω (4) 395 Ω

42. Two electric bulbs, rated at (25 W, 220 V) and (100 W, 220 V), are connected in series across a 220 V voltage source. If the 25 W and 100 W bulbs draw powers P_1 and P_2 respectively, then **[JEE (Main)-2019]**

(1) P_1 = 9 W, P_2 = 16 W

(2) P_1 = 4 W, P_2 = 16 W

(3) P_1 = 16 W, P_2 = 9 W

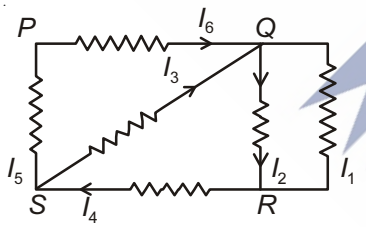
(4) P_1 = 16 W, P_2 = 4 W

43. A galvanometer, whose resistance is 50 ohm, has 25 divisions in it. When a current of 4×10^{-4} A passes through it, its needle(pointer) deflects by one division. To use this galvanometer as a voltmeter of range 2.5 V, it should be connected to a resistance of **[JEE (Main)-2019]**

(1) 6250 ohm (2) 250 ohm

(3) 200 ohm (4) 6200 ohm

44. In the given circuit diagram, the currents, I_1= – 0.3 A, I_4 = 0.8 A and I_5 = 0.4 A, are flowing as shown. The currents I_2, I_3 and I_6, respectively, are **[JEE (Main)-2019]**



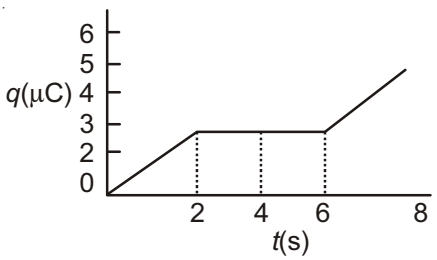
(1) 1.1 A, 0.4 A, 0.4 A

(2) 1.1 A, – 0.4 A, 0.4 A

(3) 0.4 A, 1.1 A, 0.4 A

(4) –0.4 A, 0.4 A, 1.1 A

45. The charge on a capacitor plate in a circuit, as a function of time, is shown in the figure



What is the value of current at t = 4 s? **[JEE (Main)-2019]**

(1) 2 μA (2) Zero

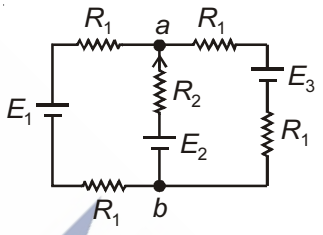
(3) 3 μA (4) 1.5 μA

46. A 200 Ω resistor has a certain color code. If one replaces the red color by green in the code, the new resistance will be **[JEE (Main)-2019]**

(1) 400 Ω (2) 500 Ω

(3) 300 Ω (4) 100 Ω

47. For the circuit shown, with R_1 = 1.0 Ω, R_2 = 2.0 Ω, E_1 = 2 V and E_2 = E_3 = 4 V, the potential difference between the points 'a' and 'b' is approximately (in V) **[JEE (Main)-2019]**



(1) 2.7 (2) 3.7

(3) 2.3 (4) 3.3

48. A cell of internal resistance r drives current through an external resistance R. The power delivered by the cell to the external resistance will be maximum when : **[JEE (Main)-2019]**

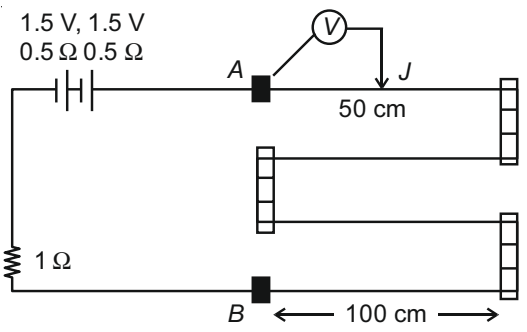
(1) R = 1000 r

(2) R = r

(3) R = 2r

(4) R = 0.001 r

49. In the circuit shown, a four-wire potentiometer is made of a 400 cm long wire, which extends between A and B. The resistance per unit length of the potentiometer wire is r = 0.01 Ω/cm. If an ideal voltmeter is connected as shown with jockey J at 50 cm from end A, the expected reading of the voltmeter will be: **[JEE (Main)-2019]**



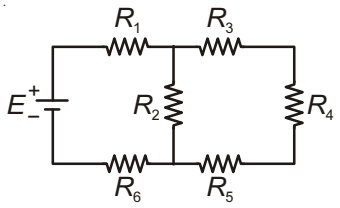
(1) 0.75 V (2) 0.50 V

(3) 0.20 V (4) 0.25 V

50. In the figure shown, what is the current (in Ampere) drawn from the battery? You are given :

R_1 = 15 Ω, R_2 = 10 Ω, R_3 = 20 Ω, R_4 = 5 Ω, R_5 = 25 Ω, R_6 = 30 Ω, E = 15 V

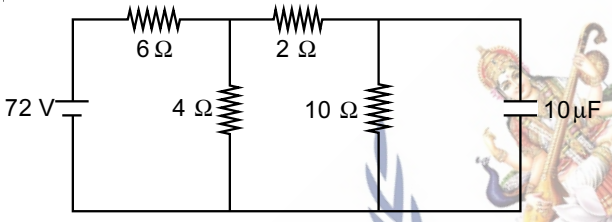
[JEE (Main)-2019]



(1) $\frac{13}{24}$ (2) $\frac{9}{32}$

(3) $\frac{20}{3}$ (4) $\frac{7}{18}$

51. Determine the charge on the capacitor in the following circuit. **[JEE (Main)-2019]**

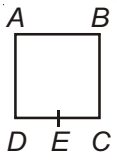


(1) 200 μC (2) 60 μC

(3) 10 μC (4) 2 μC

52. A wire of resistance R is bent to form a square $ABCD$ as shown in the figure. The effective resistance between E and C is

(E is mid-point of arm CD) **[JEE (Main)-2019]**



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

(3) $\frac{1}{16}R$ (4) $\frac{7}{64}R$

53. A moving coil galvanometer has resistance 50 Ω and it indicates full deflection at 4 mA current. A voltmeter is made using this galvanometer and a 5 kΩ resistance. The maximum voltage, that can be measured using this voltmeter, will be close to **[JEE (Main)-2019]**

(1) 10 V (2) 20 V

(3) 15 V (4) 40 V

54. 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° at the centre, the equivalent resistance between these two points will be

[JEE (Main)-2019]

(1) $\frac{5}{3}$ Ω (2) $\frac{5}{2}$ Ω

(3) $\frac{7}{2}$ Ω (4) $\frac{12}{5}$ Ω

55. The resistance of a galvanometer is 50 ohm and the maximum current which can be passed through it is 0.002 A. What resistance must be connected to it in order to convert it into an ammeter of range 0 – 0.5 A? **[JEE (Main)-2019]**

(1) 0.2 ohm (2) 0.002 ohm

(3) 0.5 ohm (4) 0.02 ohm

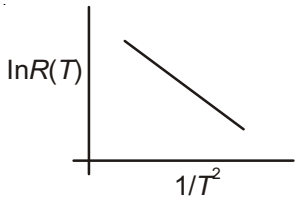
56. In a conductor, if the number of conduction electrons per unit volume is 8.5 × 10^{28} m^{-3} and mean free time is 25 fs (femto second), its approximate resistivity is (m_e = 9.1 × 10^{-31} kg)

[JEE (Main)-2019]

(1) 10^{-5} Ωm (2) 10^{-6} Ωm

(3) 10^{-7} Ωm (4) 10^{-8} Ωm

57. In an experiment, the resistance of a material is plotted as a function of temperature (in some range). As shown in the figure, it is a straight line.



One may conclude that : **[JEE (Main)-2019]**

(1) $R(T) = \frac{R_0}{T^2}$ (2) $R(T) = R_0 e^{-T_0^2/T^2}$

(3) $R(T) = R_0 e^{-T^2/T_0^2}$ (4) $R(T) = R_0 e^{T^2/T_0^2}$

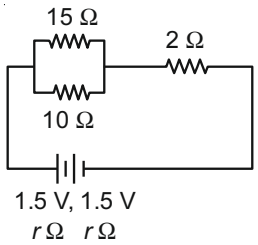
58. A moving coil galvanometer allows a full scale current of 10^{-4} A. A series resistance of 2 MΩ is required to convert the above galvanometer into a voltmeter of range 0 – 5 V. Therefore the value of shunt resistance required to convert the above galvanometer into an ammeter of range 0–10 mA is:

[JEE (Main)-2019]

(1) 200 Ω (2) 500 Ω

(3) 100 Ω (4) 10 Ω

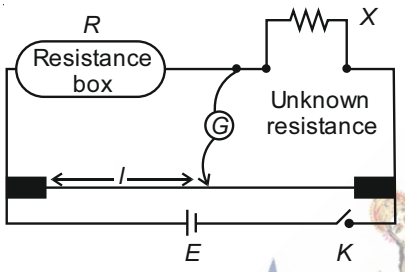
59. In the given circuit, an ideal voltmeter connected across the 10 Ω resistance reads 2 V. The internal resistance *r*, of each cell is : **[JEE (Main)-2019]**



(1) 0.5 Ω (2) 0 Ω

(3) 1.5 Ω (4) 1 Ω

60. In a meter bridge experiment, the circuit diagram and the corresponding observation table are shown in figure. **[JEE (Main)-2019]**



Sl. No	*R* (Ω)	*l* (cm)
1.	1000	60
2.	100	13
3.	10	1.5
4.	1	1.0

Which of the readings is inconsistent ?

(1) 3 (2) 2

(3) 1 (4) 4

61. A current of 5 A passes through a copper conductor (resistivity = 1.7×10^{-8} Ω m) of radius of cross-section 5 mm. Find the mobility of the charges if their drift velocity is 1.1×10^{-3} m/s. **[JEE (Main)-2019]**

(1) 1.3 m^2/Vs (2) 1.8 m^2/Vs

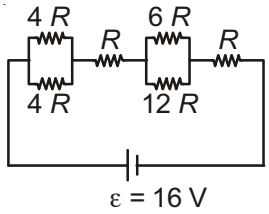
(3) 1.5 m^2/Vs (4) 1.0 m^2/Vs

62. Space between two concentric conducting spheres of radii *a* and *b* (*b* > *a*) is filled with a medium of resistivity ρ. The resistance between the two spheres will be: **[JEE (Main)-2019]**

(1) $\frac{\rho}{4\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$ (2) $\frac{\rho}{2\pi}\left(\frac{1}{a}-\frac{1}{b}\right)$

(3) $\frac{\rho}{2\pi}\left(\frac{1}{a}+\frac{1}{b}\right)$ (4) $\frac{\rho}{4\pi}\left(\frac{1}{a}+\frac{1}{b}\right)$

63. The resistive network shown below is connected to a D.C. source of 16 V. The power consumed by the network is 4 watt. The value of *R* is : **[JEE (Main)-2019]**

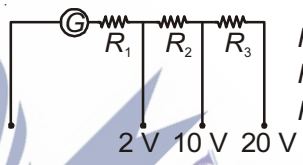


(1) 8 Ω (2) 1 Ω

(3) 16 Ω (4) 6 Ω

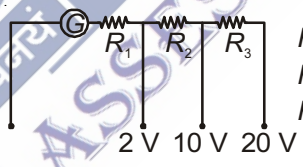
64. A galvanometer of resistance 100 Ω has 50 divisions on its scale and has sensitivity of 20 μA/division. It is to be converted to a voltmeter with three ranges, of 0-2 V, 0-10 V and 0-20 V. The appropriate circuit to do so is : **[JEE (Main)-2019]**

(1)



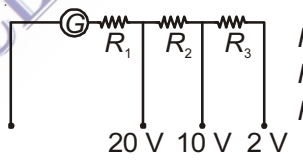
$R_1 = 1900\ \Omega$
$R_2 = 8000\ \Omega$
$R_3 = 10000\ \Omega$

(2)



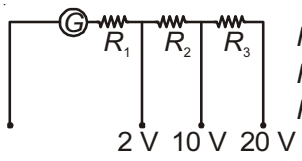
$R_1 = 1900\ \Omega$
$R_2 = 9900\ \Omega$
$R_3 = 19900\ \Omega$

(3)



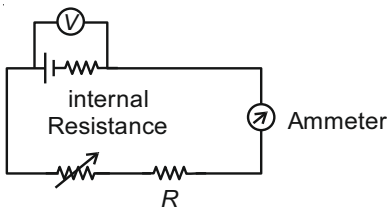
$R_1 = 19900\ \Omega$
$R_2 = 9900\ \Omega$
$R_3 = 1900\ \Omega$

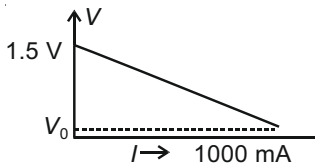
(4)



$R_1 = 2000\ \Omega$
$R_2 = 8000\ \Omega$
$R_3 = 10000\ \Omega$

65. To verify Ohm's law, a student connects the voltmeter across the battery as, shown in the figure. The measured voltage is plotted as a function of the current, and the following graph is obtained : **[JEE (Main)-2019]**





If V_0 is almost zero, identify the correct statement :

(1) The emf of the battery is 1.5 V and its internal resistance is 1.5 Ω

(2) The emf of the battery is 1.5 V and the value of R is 1.5 Ω

(3) The value of the resitance *R* is 1.5 Ω

(4) The potential difference across the battery is 1.5 V when it sends a current of 1000 mA

66. A moving coil galvanometer, having a resistance *G*, produces full scale deflection when a current I_g flows through it. This galvanometer can be converted into (i) an ammeter of range 0 to $I_0 (I_0 > I_g)$ by connecting a shunt resistance R_A to it and (ii) into a voltmeter of range 0 to $V (V = GI_0)$ by connecting a series resistance R_V to it. Then,

[JEE (Main)-2019]

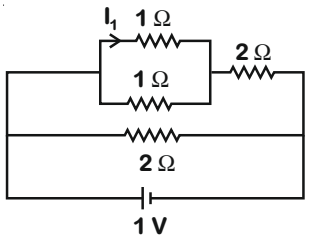
(1) $R_A R_V = G^2 and \frac{R_A}{R_V} = \left(\frac{I_g}{I_0 - I_g}\right)^2$

(2) $R_A R_V = G^2 \left(\frac{I_g}{I_0 - I_g}\right)$ and $\frac{R_A}{R_V} = \left(\frac{I_0 - I_g}{I_g}\right)^2$

(3) $R_A R_V = G^2$ and $\frac{R_A}{R_V} = \frac{I_g}{(I_0 - I_g)}$

(4) $R_A R_V = G^2 \left(\frac{(I_0 - I_g)}{I_g}\right)$ and $\frac{R_A}{R_V} = \left(\frac{I_g}{(I_0 - I_g)}\right)^2$

67. The current I_1 (in A) flowing through 1 Ω resistor in the following circuit is **[JEE (Main)-2020]**



(1) 0.5 (2) 0.4

(3) 0.25 (4) 0.2

68. In a building there are 15 bulbs of 45 W, 15 bulbs of 100 W, 15 small fans of 10 W and 2 heaters of 1 kW. The voltage of electric main is 220 V. The minimum fuse capacity (rated value) of the building will be **[JEE (Main)-2020]**

(1) 15 A (2) 10 A

(3) 20 A (4) 25 A

69. The length of a potentiometer wire is 1200 cm and it carries a current of 60 mA. For a cell of emf 5 V and internal resistance of 20 Ω, the null point on it is found to be at 1000 cm. The resistance of whole wire is **[JEE (Main)-2020]**

(1) 80 Ω (2) 100 Ω

(3) 60 Ω (4) 120 Ω

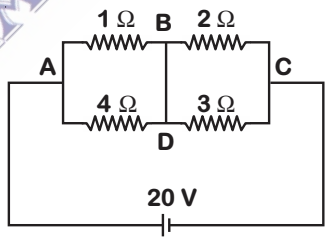
70. A galvanometer having a coil resistance 100 Ω gives a full scale deflection when a current of 1 mA is passed through it. What is the value of the resistance which can convert this galvanometer into a voltmeter giving full scale deflection for a potential difference of 10 V? **[JEE (Main)-2020]**

(1) 10 *k*Ω (2) 9.9 *k*Ω

(3) 8.9 *k*Ω (4) 7.9 *k*Ω

71. In the given circuit diagram, a wire is joining points *B* and *D*. The current in this wire is

[JEE (Main)-2020]



(1) 0.4 A (2) 4 A

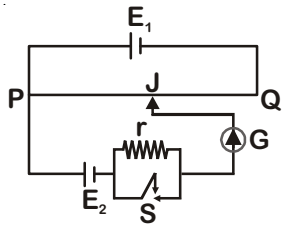
(3) 2 A (4) zero

72. Consider four conducting materials copper, tungsten, mercury and aluminium with resistivity ρ_C, ρ_T, ρ_M and ρ_A respectively **[JEE (Main)-2020]**

(1) $\rho_M > \rho_A > \rho_C$ (2) $\rho_C > \rho_A > \rho_T$

(3) $\rho_A > \rho_M > \rho_C$ (4) $\rho_A > \rho_T > \rho_C$

73. A potentiometer wire *PQ* of 1 m length is connected to a standard cell E_1. Another cell E_2 of emf 1.02 V is connected with a resistance '*r*' and switch *S* (as shown in figure). With switch *S* open, the null position is obtained at a distance of 49 cm from *Q*. The potential gradient in the potentiometer wire is **[JEE (Main)-2020]**

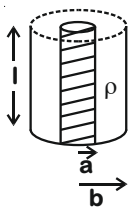


(1) 0.04 V/cm (2) 0.01 V/cm

(3) 0.02 V/cm (4) 0.03 V/cm

74. Model a torch battery of length *l* to be made up of a thin cylindrical bar of radius '*a*' and a concentric thin cylindrical shell of radius '*b*' filled in between with an electrolyte of resistivity ρ (see figure). If the battery is connected to a resistance of value *R*, the maximum Joule heating in *R* will take place for

[JEE (Main)-2020]



(1) $R = \frac{\rho}{\pi l}\ln\left(\frac{b}{a}\right)$ (2) $R = \frac{2\rho}{\pi l}\ln\left(\frac{b}{a}\right)$

(3) $R = \frac{\rho}{2\pi l}\ln\left(\frac{b}{a}\right)$ (4) $R = \frac{\rho}{2\pi l}\left(\frac{b}{a}\right)$

75. Which of the following will NOT be observed when a multimeter (operating in resistance measuring mode) probes connected across a component, are just reversed? **[JEE (Main)-2020]**

(1) Multimeter shows NO deflection in both cases i.e., before and after reversing the probes if the chosen component is capacitor

(2) Multimeter shows NO deflection in both cases i.e., before and after reversing the probes if the chosen component is metal wire

(3) Multimeter shows a deflection, accompanied by a splash of light out of connected component in one direction and NO deflection on reversing the probes if the chosen component is LED

(4) Multimeter shows an equal deflection in both cases i.e. before and after reversing the probes if the chosen component is resistor

76. Two resistors 400 Ω and 800 Ω are connected in series across a 6 V battery. The potential difference measured by a voltmeter of 10 kΩ across 400 Ω resistor is close to

[JEE (Main)-2020]

(1) 2.05 V (2) 1.8 V

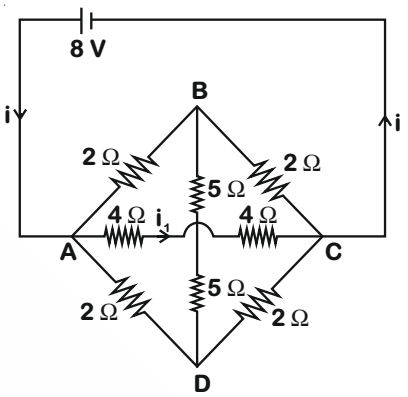
(3) 2 V (4) 1.95 V

77. A battery of 3.0 V is connected to a resistor dissipating 0.5 W of power. If the terminal voltage of the battery is 2.5 V, the power dissipated within the internal resistance is **[JEE (Main)-2020]**

(1) 0.10 W (2) 0.072 W

(3) 0.50 W (4) 0.125 W

78. The value of current i_1 flowing from *A* to *C* in the circuit diagram is **[JEE (Main)-2020]**



(1) 1 A (2) 4 A

(3) 5 A (4) 2 A

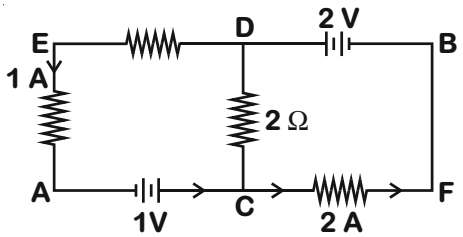
79. A galvanometer of resistance *G* is converted into a voltmeter of range 0 – 1 V by connecting a resistance R_1 in series with it. The additional resistance that should be connected in series with R_1 to increase the range of the voltmeter to 0 – 2 V will be **[JEE (Main)-2020]**

(1) *G* (2) R_1

(3) $R_1 + G$ (4) $R_1 - G$

80. In the circuit, given in the figure currents in different branches and value of one resistor are shown. Then potential at point *B* with respect to the point *A* is

[JEE (Main)-2020]



(1) +1 V (2) –2 V

(3) +2 V (4) –1 V

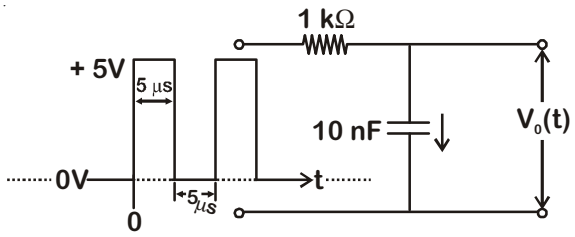
81. A galvanometer is used in laboratory for detecting the null point in electrical experiments. If, on passing a current of 6 mA it produces a deflection of 2°, its figure of merit is close to

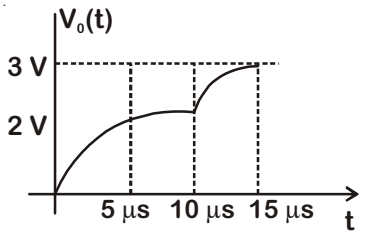
[JEE (Main)-2020]

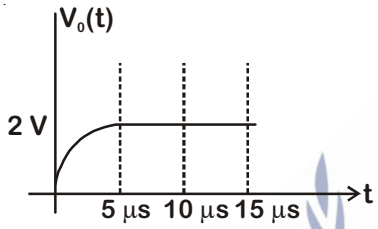
(1) 6×10^{-3} A/div. (2) 666° A/div.

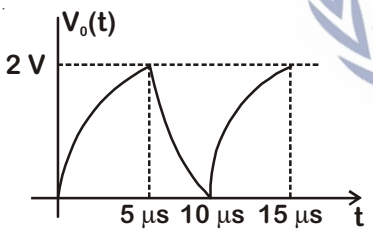
(3) 3×10^{-3} A/div. (4) 333° A/div.

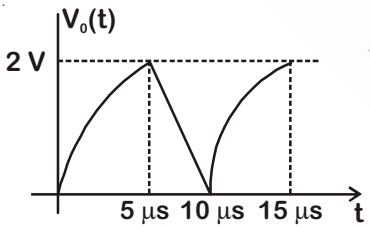
82. For the given input voltage waveform $V_{in}(t)$, the output voltage waveform $V_0(t)$, across the capacitor is correctly depicted by **[JEE (Main)-2020]**



(1)


(2)


(3)


(4)


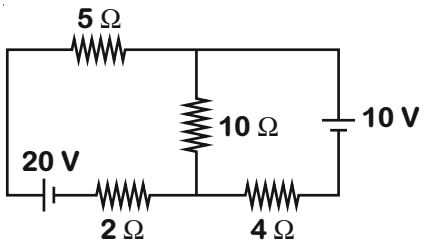
83. A circuit to verify Ohm's law uses ammeter and voltmeter in series or parallel connected correctly to the resistor. In the circuit **[JEE (Main)-2020]**

(1) Ammeter is always connected in series and voltmeter in parallel

(2) Both ammeter and voltmeter must be connected in parallel

(3) Ammeter is always used in parallel and voltmeter is series

(4) Both ammeter and voltmeter must be connected in series

84.


In the figure shown, the current in the 10 V battery is close to **[JEE (Main)-2020]**

(1) 0.36 A from negative to positive terminal

(2) 0.42 A from positive to negative terminal

(3) 0.71 A from positive to negative terminal

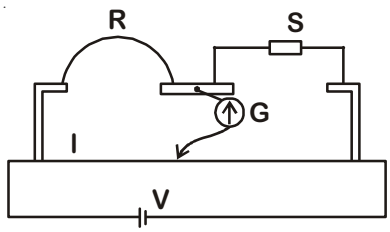
(4) 0.21 A from positive to negative terminal

85. The balancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of 10 Ω is connected in parallel to the cell, the balancing length changes by 60 cm. If the internal resistance of the cell is $\frac{N}{10}\Omega$, where N is an integer then value of N is _____. **[JEE (Main)-2020]**

86. Four resistances of 15 Ω, 12 Ω, 4 Ω and 10 Ω respectively in cyclic order to form Wheatstone's network. The resistance that is to be connected in parallel with the resistance of 10 Ω to balance the network is _____ Ω. **[JEE (Main)-2020]**

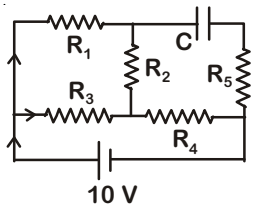
87. The series combination of two batteries, both of the same emf 10 V, but different internal resistance of 20 Ω and 5 Ω, is connected to the parallel combination of two resistors 30 Ω and R Ω. The voltage difference across the battery of internal resistance 20 Ω is zero, the value of R (in Ω) is _____. **[JEE (Main)-2020]**

88. In a meter bridge experiment S is a standard resistance. R is a resistance wire. It is found that balancing length is l = 25 cm. If R is replaced by a wire of half length and half diameter that of R of same material, then the balancing distance l' (in cm) will now be _____. **[JEE (Main)-2020]**



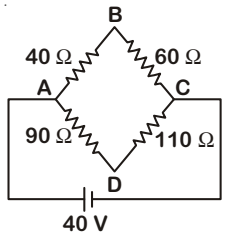
89. An ideal cell of emf 10 V is connected in circuit shown in figure. Each resistance is 2 Ω. The potential difference (in V) across the capacitor when it is fully charged is _____.

[JEE (Main)-2020]



90. Four resistances 40 Ω, 60 Ω, 90 Ω and 110 Ω make the arms of a quadrilateral *ABCD*. Across *AC* is a battery of emf 40 V and internal resistance negligible. The potential difference across *BD* in *V* is _____.

[JEE (Main)-2020]



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