PREVIOUS YEARS' QUESTIONS EXERCISE-II

1. If an ammeter is to be used in place of a voltmeter, then we must connect with the ammeter a- **[AIEEE - 2002]**

(1) low resistance in parallel
(2) high resistance in parallel
(3) high resistance in series
(4) low resistance in series

2. By increasing the temperature, the specific resistance of a conductor and a semiconductor- **[AIEEE - 2002]**

(1) increases for both
(2) decreases for both
(3) increases, decreases respectively
(4) decreases, increases respectively

3. The length of a wire of a potentiometer is 100 cm, and the emf of its standard cell is E volt. It is employed to measure the emf of a battery whose internal resistance is 0.5 Ω If the balance point is obtained at ℓ = 30 cm from the positive end, the emf of the battery is- **[AIEEE - 2003]**

(1) $\frac{30E}{100.5}$

(2) $\frac{30E}{100 - 0.5}$

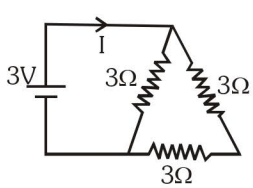
(3) $\frac{30(E-0.5i)}{100}$, where i is the current in the potentiometer wire

(4) $\frac{30E}{100}$

4. An ammeter reads upto 1 A. Its internal resistance is 0.81 Ω. To increase the range to 10 A, the value of the required shunt is- **[AIEEE - 2003]**

(1) 0.03 Ω (2) 0.3 Ω (3) 0.9 Ω (4) 0.09 Ω

5. A 3V battery with negligible internal resistance is connected in a circuit as shown in the figure. The current I, in the circuit will be- **[AIEEE - 2003]**

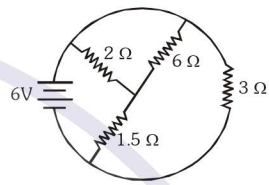


(1) 1 A (2) 1.5 A (3) 2 A (4) $\frac{1}{3}$ A

6. The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be- **[AIEEE - 2003]**

(1) 200 % (2) 100 % (3) 50 % (4) 300 %

7. The total current supplied to the circuit by the battery is- **[AIEEE - 2004]**



(1) 1 A (2) 2 A (3) 4 A (4) 6 A

8. The resistance of the series combination of two resistance is S. When they are joined in parallel, the total resistance is P. If S = nP, then the minimum possible value of n is- **[AIEEE - 2004]**

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

9. An electric current is passed through a circuit containing two wires of the same material, connected in parallel. It the lengths and radii of the wires are in the ratio of 4/3 and 2/3, then the ratio of the currents passing through the wire will be- **[AIEEE - 2004]**

(1) 3 (2) 1/3 (3) 8/9 (4) 2

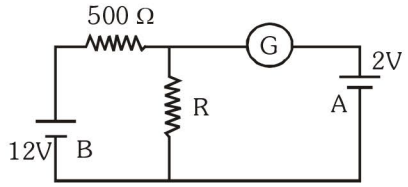
10. In a metre bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y ? **[AIEEE - 2004]**

(1) 50 cm (2) 80 cm (3) 40 cm (4) 70 cm

11. The thermistor are usually made of- **[AIEEE - 2004]**

(1) metals with low temperature coefficient of resistivity
(2) metals with high temperature coefficient of resistivity
(3) metal oxides with high temperature coefficient of resistivity
(4) semiconductor materials having low temperature coefficient of resistivity

12. In the circuit, the galvanometer G shows zero deflection. If the batteries A and B have negligible internal resistance, the value of the resistor R will be- **[AIEEE - 2005]**



(1) 200 Ω (2) 100 Ω (3) 500 Ω (4) 1000 Ω

13. Two sources of equal emf are connected to an external resistance R. The internal resistances of the two sources are R_1 and R_2 ($R_2 > R_1$). If the potential difference across the source having internal resistance R_2, is zero, then- **[AIEEE - 2005]**

(1) $R = \dfrac{R_2 \times (R_1 + R_2)}{(R_2 - R_1)}$ (2) $R = R_2 - R_1$

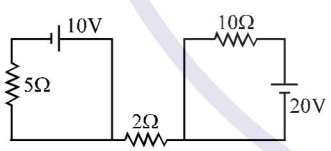
(3) $R = \dfrac{R_1 R_2}{(R_1 + R_2)}$ (4) $R = \dfrac{R_1 R_2}{(R_2 - R_1)}$

14. An energy source will supply a constant current into the load, if its internal resistance is- **[AIEEE - 2005]**
(1) equal to the resistance of the load
(2) very large as compared to the load resistance
(3) zero
(4) non-zero but less than the resistance of the load

15. In a potentiometer experiment the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of 2Ω, the balancing length becomes 120 cm. The internal resistance of the cell is- **[AIEEE - 2005]**

(1) 1 Ω (2) 0.5 Ω (3) 4 Ω (4) 2 Ω

16. In the figure shown the current through 2Ω resistor is **[IIT-JEE 2005 (Scr)]**



(1) 2 A (2) 0 A (3) 4 A (4) 6 A

17. A rigid container with thermally insulated walls contains a coil of resistance 100 Ω, carrying current 1 A. Change in internal energy after 5 min will be **[IIT-JEE 2005]**

(1) zero (2) 10 kJ (3) 20 kJ (4) 30 kJ

18. The kirchhoff's first law ($\Sigma i = 0$) and second law ($\Sigma iR = \Sigma E$),Where the symbols have their usual meanings, are respectively based on- **[AIEEE - 2006]**
(1) conservation of charge, conservation of momentum
(2) conservation of energy, conservation of charge
(3) conservation of momentum, conservation of charge
(4) conservation of charge, conservation of energy

19. A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio I_B / I_A of their respective lengths must be- **[AIEEE - 2006]**

(1) 1 (2) $\dfrac{1}{2}$ (3) $\dfrac{1}{4}$ (4) 2

20. The resistance of bulb filament is 100 Ω at a temperature of 100°C. If its temperature coefficient of resistance be 0.005 per °C, its resistance will become 200 Ω at a temperature of- **[AIEEE - 2006]**

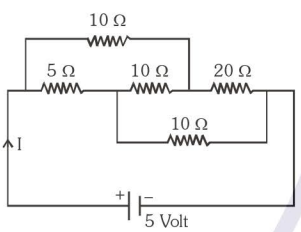
(1) 300 °C (2) 400 °C (3) 500 °C (4) 200 °C

21. In a wheatstone's bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be- **[AIEEE - 2006]**

(1) $\dfrac{P}{Q} = \dfrac{2R}{S_1 + S_2}$ (2) $\dfrac{P}{Q} = \dfrac{R(S_1 + S_2)}{S_1 S_2}$

(3) $\dfrac{P}{Q} = \dfrac{R(S_1 + S_2)}{2S_1 S_2}$ (4) $\dfrac{P}{Q} = \dfrac{R}{S_1 + S_2}$

22. The current I drawn from the 5 volt source will be- **[AIEEE - 2006]**

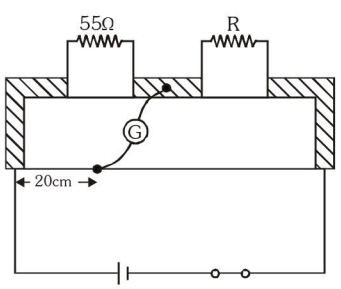


(1) 0.33 A (2) 0.5 A (3) 0.67 A (4) 0.17 A

23. The resistance of a wire is 5Ω at 50 °C and 6 Ω at 100 °C. The resistance of the wire at 0 °C will be- **[AIEEE - 2007]**

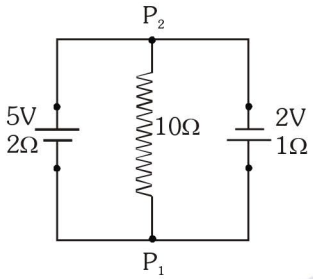
(1) 2 Ω (2) 1 Ω (3) 4 Ω (4) 3 Ω

24. Shown in the figure below is a meter - bridge set up with null deflection in the galvanometer **[AIEEE - 2008]**



The value of the unknown resistor R is
(1) 13.75Ω (2) 220 Ω (3) 110Ω (4) 55Ω

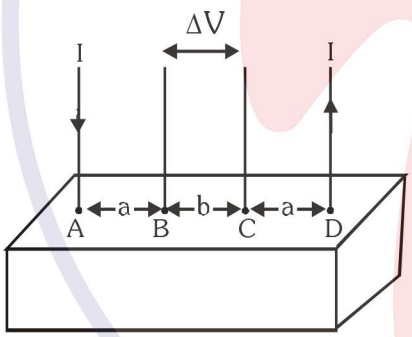
25. A 5V battery with internal resistance 2Ω and a 2V battery with internal resistance 1Ω are connected to a 10 Ω resistor as shown in the figure. The current in the 10Ω resistor is **[AIEEE - 2008]**



(1) 0.27 A P_2 to P_1 (2) 0.03 A P_1 to P_2
(3) 0.03 A P_2 to P_1 (4) 0.27 A P_1 to P_2

Directions : Question No. 26 and 27 are based on the following paragraph.

Consider a block of conducting material of resistivey 'ρ' shown in the figure. Current 'I' enters at 'A' and leaves from 'D'. We apply superposition principle to find voltage 'ΔV' developed between 'B' and 'C'. The calculation is done in the following steps : **[AIEEE - 2008]**



(i) Take current 'I' entering from 'A' and assume it to spread over a hemispherical surface in the block.
(ii) Calculate field E(r) at distance 'r' from A by using Ohm's law E = ρj , where j is the current per unit area at 'r'
(iii) From the 'r' dependence of E(r), obtain the potential V(r) at r.
(iv) Repeat (i), (ii) and (iii) for current 'I' leaving 'D' and superpose results for 'A' and 'D'

26. For current entering at A, the electric field at a distance 'r' from A is

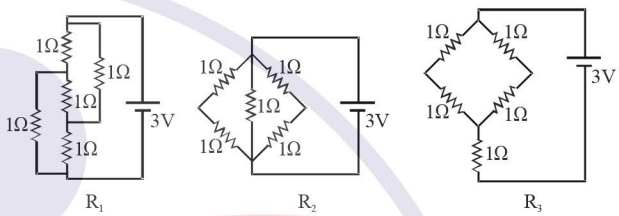
(1) $\frac{\rho I}{8\pi r^2}$ (2) $\frac{\rho I}{r^2}$ (3) $\frac{\rho I}{2\pi r^2}$ (4) $\frac{\rho I}{4\pi r^2}$

27. ΔV measured between B and C is

(1) $\frac{\rho I}{\pi a}-\frac{\rho I}{\pi(a+b)}$ (2) $\frac{\rho I}{a}-\frac{\rho I}{(a+b)}$

(3) $\frac{\rho I}{2\pi a}-\frac{\rho I}{2\pi(a+b)}$ (4) $\frac{\rho I}{2\pi(a+b)}$

28. Figure shows three resistor configurations R_1, R_2 and R_3 connected to 3V battery. If the power dissipated by the configuration R_1, R_2 and R_3 is P_1, P_2 and P_3 respectively, then **[IIT-JEE 2008]**



(1) $P_1 > P_2 > P_3$ (2) $P_1 > P_3 > P_2$
(3) $P_2 > P_1 > P_3$ (4) $P_3 > P_2 > P_1$

29. **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 100Ω to 150Ω 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 not the correct explanation of Statement–1
(2) Statement–1 is false, Statement–2 is true
(3) Statement–1 is true, Statement–2 is false
(4) Statement–1 is true, Statement–2 is true; Statement–2 is the correct explanation of Statement–1

30. 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) $\alpha_1+\alpha_2, \frac{\alpha_1\alpha_2}{\alpha_1+\alpha_2}$

31. If a wire is stretched to make it 0.1 % longer its resistance will :- **[AIEEE - 2011]**
(1) decrease by 0.2% (2) decrease by 0.05%
(3) increase by 0.05% (4) increase by 0.2%

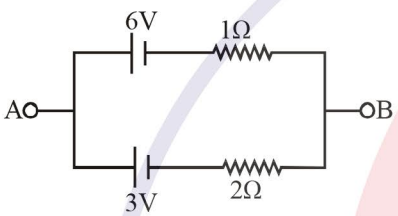
32. If 400 Ω of resistance is made by adding four 100 Ω resistance of tolerance 5%, then the tolerance of the combination is : **[AIEEE - 2011]**

(1) 20% (2) 5% (3) 10% (4) 15%

33. 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) 0.2 V/m (2) 1 V/m
(3) 0.5 V/m (4) 0.1 V/m

34. Two batteries of different emfs and different internal resistances are connected as shown. The voltage across AB in volts is **[IIT-JEE 2011]**



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

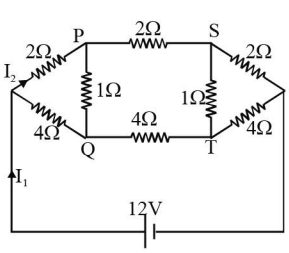
35. Resistance of a given wire is obtained by measuring the current flowing in it and the voltage difference applied across it. If the percentage errors in the measurement of the current and the voltage difference are 3% each, then error in the value of resistance of the wire is :- **[AIEEE - 2012]**

(1) 3% (2) 6% (3) zero (4) 1%

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

(1) Neither (2) Both
(3) 100 W (4) 25 W

37. For the resistance network shown in the figure, choose the correct option(s). **[IIT-JEE 2012]**



(1) the current through PQ is zero
(2) I_1 = 3A
(3) The potential at S is less than that at Q
(4) I_2 = 2A

38. The supply voltage to a room is 120V. The resistance of the lead wires is 6Ω. 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-Mains 2013]**

(1) zero Volt (2) 2.9 Volt
(3) 13.3 Volt (4) 10.04 Volt

39. This question has Statement I and Statement II. Of the four choice given after the Statements, choose the one that best describes the two Statements. **[JEE-Mains 2013]**

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.

(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.

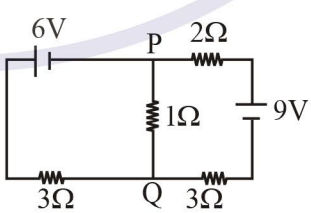
40. In a large building, there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be : **[JEE-Mains 2014]**

(1) 12 A (2) 14 A (3) 8 A (4) 10 A

41. 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 :- **[JEE-Mains 2015]**

(1) 1.6×10^{-6} Ωm (2) 1.6×10^{-5} Ωm
(3) 1.6×10^{-8} Ωm (4) 1.6×10^{-7} Ωm

42.



In the circuit shown, the current in the 1Ω resistor is :- **[JEE-Mains 2015]**

(1) 0.13 A, from Q to P
(2) 0.13 A, from P to Q
(3) 1.3 A, from P to Q
(4) 0A

43. A galvanometer having a coil resistance of 100Ω 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 10A, is :- **[JEE-Main 2016]**

(1) 3Ω (2) 0.01Ω (3) 2Ω (4) 0.1Ω

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

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

(2) Kirchhoff's second law represents energy conservation

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

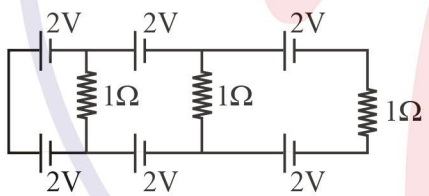
(4) In a balanced wheatstone bridge if the cell and the galvanometer are exchanged, the null point is disturbed.

45. 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 to voltmeter of range 0 – 10 V is:- **[JEE-Main 2017]**

(1) 2.535×10^3 Ω (2) 4.005×10^3 Ω

(3) 1.985×10^3 Ω (4) 2.045×10^3 Ω

46. In the above circuit the current in each resistance is:- **[JEE-Main 2017]**



(1) 0.5 A (2) 0 A (3) 1 A (4) 0.25 A

47. 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) 1.5 Ω (2) 2 Ω

(3) 2.5 Ω (4) 1 Ω

48. 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) 505 kΩ (2) 550 kΩ

(3) 910 kΩ (4) 990 kΩ

49. 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) 11.5 V and 11.6 V

(2) 11.4 V and 11.5 V

(3) 11.7 V and 11.8 V

(4) 11.6 V and 11.7 V

PREVIOUS YEARS QUESTIONS				ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**3**	**3**	**4**	**4**	**2**	**4**	**3**	**1**	**2**	**1**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**3**	**2**	**2**	**3**	**4**	**2**	**4**	**4**	**4**	**2**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**1**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**4**	**2**	**4**	**4**	**2**	**4**	**1,2,3,4**	**4**	**4**	**1**
Que.	41	42	43	44	45	46	47	48	49	
Ans.	**2**	**1**	**2**	**4**	**3**	**2**	**1**	**2**	**1**	