Exercise-1

ONLY ONE OPTION CORRECT TYPE

SECTION (A) : DEFINITION OF CURRENT, CURRENT DENSITIES, DRIFT

1. The drift velocity of electrons in a conducting wire is of the order of 1mm/s, yet the bulb glows very quickly after the switch is put on because
(1) The random speed of electrons is very high, of the order of 10_6 m/s
(2) The electrons transfer their energy very quickly through collisions
(3) Electric field is set up in the wire very quickly, producing a current through each cross section, almost intantaneously
(4) All of above

2. In the presence of an applied electric field ($\vec{E}$) in a metallic conductor.
(1) The electrons move in the direction of $\vec{E}$
(2) The electrons move in a direction opposite to $\vec{E}$
(3) The electrons may move in any direction randomly, but slowly drift in the direction of $\vec{E}$.
(4) The electrons move randomly but slowly drift in a direction opposite to $\vec{E}$.

3. A current of 4.8 A is flowing in a conductor. The number of electrons passing through any cross-section per second is
(1) $3 \times 10_{19}$ (2) $76.8 \times 10_{20}$ (3) $7.68 \times 10_{12}$ (4) $3 \times 10_{10}$

SECTION (B) : RESISTANCE

1. Specific resistance of a wire depends on its
(1) mass (2) length (3) area of cross–section (4) None of the above

2. There are two wires of the same length and of the same material and radii r and 2r. The ratio of their specific resistance is
(1) 1 : 2 (2) 1 : 1 (3) 1 : 4 (4) 4 : 1

3. If the length and cross-section of a wire is doubled, then the resistance will
(1) become half (2) increase two times (3) remain unchanged (4) increase four times

4. V-i graph for an ohmic resistance is
(1) straight line (2) hyperbola (3) parabola (4) circle

5. When a resistance wire is passed through a die the cross–section area decreases by 1%, the change in resistance of the wire is
(1) 1% decrease (2) 1% increase (3) 2% decrease (4) 2% increase

6. When the resistance of copper wire is 0.1 Ω and the radius is 1 mm, then the length of the wire is (specific resistance of copper is $3.14 \times 10_{-8}$ ohm x m)
(1) 10 cm (2) 10 m (3) 100 m (4) 100 cm

7. Three copper wires of length and cross–sectional area (L, A), (2L, A/2) and (L/2, 2A). Resistance is minimum in
(1) wire of cross–sectional area A (2) wire of area A/2
(3) wire of cross–sectional area 2A (4) same in all three cases

8. The resistance of a wire of cross-section 'a' and length 'ℓ' is R ohm. The resistance of another wire of the same material and of the same length but cross-section '4a' will be

(1) 4R (2) $\frac{R}{4}$ (3) $\frac{R}{16}$ (4) 16 R

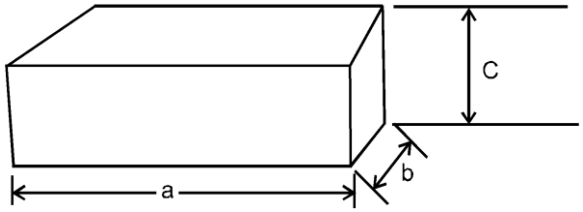
9. The resistance of wire is R ohm. The wire is stretched to half of its diameter. The resistance of the wire will now be

(1) 4 R (2) 64 R (3) R/4 (4) 16 R

10. If a wire of resistance R is stretched to double of its length, then the new resistance will be **[R-PMT 2003]**

(1) $\frac{R}{2}$ (2) 2R (3) 4R (4) 16R

11. All the edges of a block in cuboidal shape with parallel faces are unequal. Its longest edge is twice its shortest edge. The ratio of the maximum to minimum resistance between parallel faces is: (a > b > c)



(1) 2 (2) 4 (3) 8

(4) indeterminate unless the length of the third edge is specified.

12. Read the following statements carefully :

Y : The resistivity of semiconductor decreases with increase of temperature.

Z : In a conducting solid, the rate of collisions between free electrons and ions increases with increase of temperature. Select the correct statement (s) from the following :

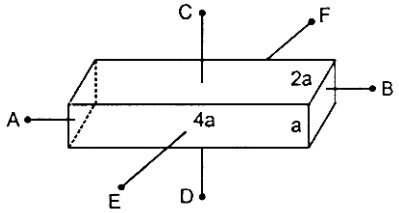
(1) Y is true but Z is false (2) Y is false but Z is true

(3) Both Y and Z are true (4) Y is true and Z is the correct reason for Y

13. The dimensions of a block are 1 cm x 1 cm x 100 cm. If the specific resistance of its material is $2\times10^{-7}\,\text{ohm}\times\text{metre}$, then the resistance between the opposite rectangular faces is

(1) $2\times10^{-9}\,\Omega$ (2) $2\times10^{-7}\,\Omega$ (3) $2\times10^{-5}\,\Omega$ (4) $2\times10^{-3}\,\Omega$

14. A conductor with rectangular cross section has dimension (a × 2a × 4a) as shown in fig. Resistance across AB is x, across CD is y and across EF is z. Then



(1) x = y = z (2) x > y > z (3) y > z > x (4) x > z > y

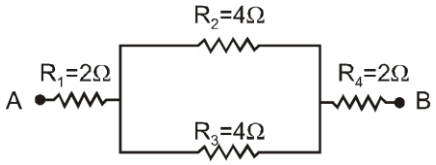
15. Resistance of a wire is 20 ohm, it is stretched upto, three times of its length, then its new resistance will be **[RPMT 2001]**

(1) 6.67 Ω (2) 60 Ω (3) 120 Ω (4) 180 Ω

16. Two wires of same dimension but resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is

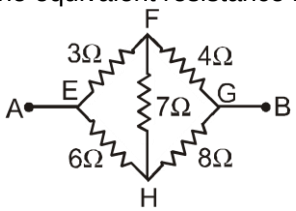
(1) $\rho_1 + \rho_2$ (2) $\left(\frac{\rho_1+\rho_2}{2}\right)$ (3) $\sqrt{\rho_1\rho_2}$ (4) $2(\rho_1 + \rho_2)$

17. In the given figure, the equivalent resistance between the points A and B is **[AIIMS 1999]**



(1) 8 Ω (2) 6 Ω (3) 4 Ω (4) 2 Ω

18. A bridge circuit is shown in figure.The equivalent resistance between A and B will be : **[AIPMT 2000]**



(1) 21Ω (2) 7Ω (3) $\frac{252}{85}\Omega$ (4) $\frac{14}{3}\Omega$

19. A cylindrical wire is stretched upto twice of its length, then its resistance becomes : **[RPMT 2000]**

(1) 4 times (2) unchanged (3) $\frac{1}{2}$ times (4) 2 times

20. Si and Cu are cooled to a temperature of 300K, then resistivity : **[AIPMT2001]**

(1) For Si increases and for Cu decreases (2) For Cu increases and for Si decreases
(3) Decreases for both Si and Cu (4) Increases for both Si and Cu

21. Two copper wires are of same length one of the twice as thick as the other. Then the resistance of the two wires are in the ratio of : **[R-PMT 2005]**

(1) 1 : 16 (2) 1 : 8 (3) 1 : 4 (4) 1 : 2

22. If resistance of wire at 50ºC is 5RΩ and 100ºC is 6RΩ, find resistance of 0ºC : **[RPMT 2006]**

(1) 0RΩ (2) 2RΩ (3) 3RΩ (4) 4RΩ

23. For a metallic wire, the ratio ($V=\frac{V}{i}$ applied potential difference and i = current flowing) is **[R-PMT 2008]**

(1) independent of temperature
(2) increases as the temperature rises
(3) decreases as the temperature rises
(4) increases or decreases as temperature rises depending upon the metal

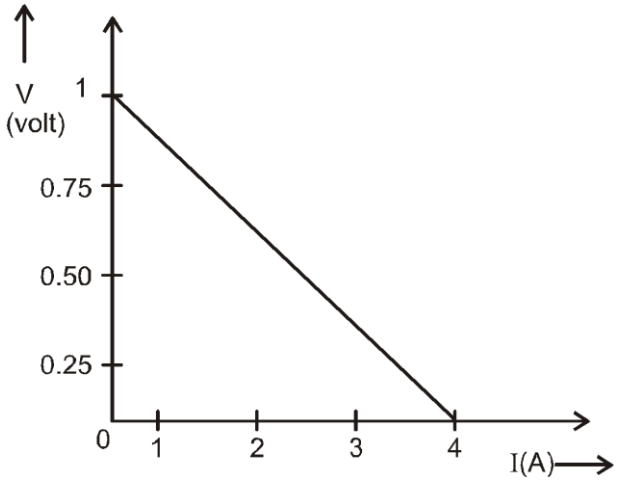
24. The length of given cylindrical wire is increassed by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be **[R_PMT 2008]**

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

25. If on applying the potential of 20 V on a conductor its conductance becomes 8 $(\Omega)^{-1}$, then the current flowing through it will be **[R_PMT 2009]**

(1) 120 A (2) 160 A (3) 90 A (4) 80 A

26. The figure shows a graph of current (I) flowing throught a cell against its terminal voltage (V). The emf and internal resistance of this cell are **[RPMT-2014]**



(1) 1 V ; 0.25 Ω (2) 1 V ; 4 Ω (3) 1 V ; 1 Ω (4) 0.25 V ; 0.25 Ω

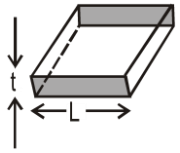
27. The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be **[AIEEE 2003, 4/300]**
(1) 300 % (2) 200 % (3) 100 % (4) 50 %

28. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will now be : **[AIEEE 2005, 4/300]**
(1) doubled (2) four times (3) one-fourth (4) half

29. 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 ℓ_A / ℓ_B of their respective lengths must be **[AIEEE 2006, 1½/180]**
(1) 2 (2) 1 (3) 1/2 (4) 1/4

30. The resistance of a wire is 5 ohm at 50º C and 6 ohm at 100ºC. The resistance of the wire at 0ºC will be **[AIEEE 2007, 3/120]**
(1) 2 ohm (2) 1 ohm (3) 4 ohm (4) 3 ohm

31. Consider a thin square sheet of side L and thickness t, made of a material of resitivity ρ. The resistance between two opposite faces, shown by the shaded areas in the figure is : **[IIT-JEE 2010; 3/163, –1]**



(1) directly proportional to L (2) directly proportional to t
(3) independent of L (4) independent of t

32. The specific resistance of a conductor increases with : **[AIPMT 2002]**
(1) Increase in temperature (2) Increases in cross-sectional area
(3) Decreases in length (4) Decrease in cross-sectional area

33. Fuse wire is a wire of : **[AIPMT 2003]**
(1) Low resistance and low melting point (2) Low resistance and high melting point
(3) High resistance and high melting point (4) High resistance and low melting point

34. The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then :
(1) The resistance will be doubled and the specific resistance will be halved **[AIPMT 2004]**
(2) The resistance will be halved and the specific resistance will remain unchanged
(3) The resistance will be halved and the specific resistance will be doubled.
(4) The resistance and the specific resistance, will both remain unchanged

35. A 6V battery is connected to the terminals of a three metre long wire of uniform thickness and resistance of 100Ω. The difference of potential between two points on the wire separated by a distance of 50 cm will be : **[AIPMT 2004]**

(1) 2V (2) 3V (3) 1V (4) 1.5 V

36. When a wire of uniform cross-section a, length ℓ and resistance R is bent into a complete circle, resistance between two of diametrically opposite points will be : **[AIPMT 2005]**

(1) $\frac{R}{4}$ (2) $\frac{R}{8}$ (3) 4R (4) $\frac{R}{2}$

37. A wire of a certain material is stretched slowly be ten per cent. Its new resistance and specific resistance become respectively. **[AIPMT 2008]**

(1) 1.2 times, 1.1 times (2) 1.21 times, same

(3) both remain the same (4) 1.1 times, 1.1 times

38. An electric kettle takes 4 A current at 220 V. How much time will it take to boil 1 kg of water from temperature 20ºC? The temperature of boiling water is 100ºC **[AIPMT 2008]**

(1) 6.3 min (2) 8.4 min (3) 12.6 min (4) 4.2 min

SECTION (C) : POWER, ENERGY, BATTERY, EMF, TERMINAL VOLTAGE, KCL & KVL

1. In an electric circuit containing a battery, the positive charge inside the battery

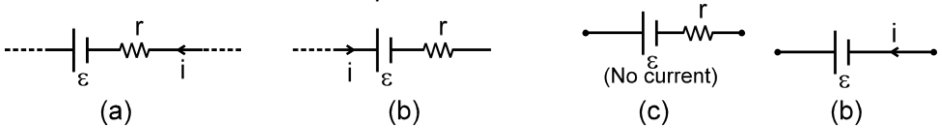
(1) always goes from the positive terminal to the negative terminal

(2) may go from the positive terminal to the negative terminal

(3) always goes from the negative terminal to the positive terminal

(4) does not move.

2. In which of the above cells, the potential difference between the terminals of a cell exceeds its emf.



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

Q.3 for the following circuits, the potential difference between X and Y in volt is

3. The efficiency of a cell when connected to a resistance R is 60%. What will be its efficiency if the external resistance is increased to six times.

(1) 80 % (2) 90% (3) 55% (4) 95%

4. Two bulbs 25W, 220V and 100W, 220V are given. Which has higher resistance ? **[AIPMT 2000]**

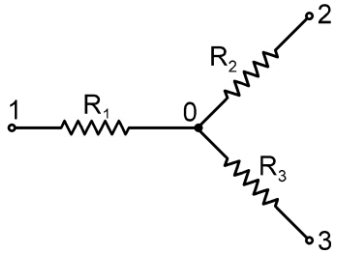
(1) 25W bulb (2) 100 W bulb

(3) Both bulbs will have equal resistance (4) Resistance of bulbs cannot be compared

5. The resistors whose ratio is 1 : 2, are connected in parallel, the ratio of power dissipated is : **[RPMT 2000]**

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

6. Find the current flowing through the resistance R_1 of the circuit shown in figure if the resistances are equal to $R_1 = 10\ \Omega$, $R_2 = 20\ \Omega$, and $R_3 = 30\ \Omega$, and the potentials of points 1, 2 and 3 are equal to $\phi_1 = 10$ V, $\phi_2 = 6$ V, and $\phi_3 = 5$ V.



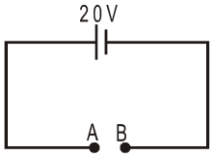
(1) 0.1 A (2) 0.2 A (3) 0.3 A (4) 0.4 A

7. In the previous question potential at point 0 is
(1) 15 V (2) 20 V (3) 25 V (4) 8 V

8. In the figure a part of circuit is shown :

(1) current will flow from A to B (2) current may flow from A to B
(3) current will flow from B to A (4) the direction of current will depend on *r*.

9. In the shown circuit, what is the potential difference across A and B **[AIIMS 1999]**



(1) 50 V (2) 45 V (3) 30 V (4) 20 V

10. A cell has an emf 1.5V. When connected across an external resistance of 2Ω, the terminal potential difference falls to 1.0V. The internal resistance of the cell is : **[AIPMT 2000]**
(1) 2Ω (2)1.52Ω (3) 1.0Ω (4) 0.5Ω

11. A battery having e.m.f. 5 V and internal resistance 0.5 Ω is connected with a resistance of 4.5 Ω then the voltage at the terminals of battery is **[RPMT 2000]**
(1) 4.5 V (2) 4 V (3) 0 V (4) 2 V

12. Watt hour meter measures **[MHCET 2002]**
(1) Current (2) Electric energy (3) Power (4) Voltage

13. Two resistors whose value are in ratio 2 : 1 are connected in parallel with one cell. Then ratio of power dissipated is **[RPMT 2000]**
(1) 2 : 1 (2) 4 : 1 (3) 1 : 2 (4) 1 : 1

14. A hot electric iron has a resistance of 80Ω and is used on a 200 V source. The electrical energy spent, if it is used for 2 hr, will be : **[R_PMT 2005]**
(1) 8000 Wh (2) 2000 Wh (3) 1000 Wh (4) 800 Wh

15. A current of 2 A flowing through a conductor produces 80 J of heat in 10 s. The resistances of the conductor is **[R_PMT 2007]**
(1) 0.5 Ω (2) 2 Ω (3) 4 Ω (4) 20 Ω

16. An electric heater of resistance 6 Ω is run for 10 min on a 120 V line. The energy liberated in this period of time is **[R-PMT 2009]**
(1) $7.2 \times 10_3$ J (2) $14.4 \times 10_5$ J (3) $43.2 \times 10_4$ J (4) $28.8 \times 10_4$ J

17. 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- **[AIEEE 2002, 4/300]**
(1) 1 (2) 4 (3) 2 (4) 3

18. A 220 volt, 1000 watt bulb is connected across a 110 volt mains supply. The power consumed will be- **[AIEEE 2003, 4/300]**

(1) 750 watt (2) 500 watt (3) 250 watt (4) 1000 watt

19. Time taken by a 836 W heater to heat one litre of water from 10ºC to 40ºC is : **[AIEEE 2004, 4/300]**

(1) 50 s (2) 100 s (3) 150 s (4) 200 s

20. The resistance of hot tungsten filament is about 10 times the cold resistance. What will be the resistance of 100 W and 200 V lamp when not in use : **[AIEEE 2005, 4/300]**

(1) 40 Ω (2) 20 Ω (3) 400 Ω (4) 200 Ω

21. An electric bulb is rated 220 volt - 100 watt. The power consumed by it when operated on 110 volt will be **[AIEEE 2006, 4½/180]**

(1) 25 watt (2) 50 watt (3) 75 watt (4) 40 watt

22. The Kirchhoff's first law $\left(\sum i = 0\right)$ and second law $\left(\sum iR = 0 = \sum E\right)$, where the symbols have their usual meanings, are respectively based on **[AIEEE 2006, 1½/180]**

(1) conservation of charge, conservation of energy
(2) conservation of charge, conservation of momentum
(3) conservation of energy, conservation of charge
(4) conservation of momentum, conservation of charge

23. An electric kettle has two heating coils. When one of the coils is connected to an AC source, the water in the kettle boils in 10 min. When the other coil is used the water boils in 40 min. If both the coils are connected in parallel, the time taken by the same quantity of water to boil will be : **[AIPMT 2003]**

(1) 25 min (2) 15 min (3) 8 min (4) 4 min

24. Two 220V, 100W bulbs are connected first in series and then in parallel. Each time the combination is connected to a 220V AC supply line. The power drawn by the combination in each case respectively will be : **[AIPMT 2003]**

(1) 200W, 150W (2) 50W, 200W (3) 50W, 100W (4) 100W, 50W

25. A battery is charged at a potential of 15V for 8H when the current flowing is 10A. The battery on discharge supplies a current of 5A for 15H. The mean terminal voltage during discharge is 14V. The "watt-hour" efficiency of the battery is : **[AIPMT 2004]**

(1) 82.5 % (2) 80% (3) 90% (4) 87.5 %

26. In India electricity is supplied for domestic use at 220V. It is supplied at 110V in USA. If resistance of a 60W bulb for use in India. is R, the resistance of a 60W bulb for use in USA will be :**[AIPMT 2004]**

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

27. A 5-A fuse wire can withstand a maximum power of 1W in circuit. The resistance of the fuse wire is : **[AIPMT 2005]**

(1) 0.2Ω (2) 5Ω (3) 0.4Ω (4) 0.04Ω

28. Kirchhoff's first and second laws for electrical circuits are consequencs of :- **[AIPMT 2006]**

(1) Conservation of energy (2) Conservation of electric charge and energy respectively
(3) Conservation of electric charge (4) Conservation of energy and elecric charge respectivelay

29. When three identical bulbs of 60W, 200 V rating are connected in series to a 200V supply, the power drawn by them will be : **[AIPMT 2004]**

(1) 60 W (2) 180 W (3) 10 W (4) 20 W

SECTION (D) : COMBINATION OF RESISTANCE

1. Two coils connected in series have resistances 600 Ω and 300 Ω at 20°C and temperature coefficient of resistivity 0.001 k_{-1} and 0.004 k_{-1} respectively.

(a) The resistance of the combination at temperature 50°C is

(1) 426 Ω (2) 954 Ω (3) 1806 Ω (4) 214 Ω

(b) The effective temperature coefficient of the combination is

(1) $\frac{1}{1000}$ degree$_{-1}$ (2) $\frac{1}{250}$ degree$_{-1}$ (3) $\frac{1}{500}$ degree$_{-1}$ (4) $\frac{3}{1000}$ degree$_{-1}$

2. A wire has a resistance of 12 ohms. If it is bent in the form of a circle. The effective resistance between the two points on any diameter is equal to

(1) 6 Ω (2) 3 Ω (3) 9 Ω (4) 12 Ω

3. A wire has a resistance 12 ohms. if it is bent in the form of a equilateral triangle. The resistance between any two terminals is

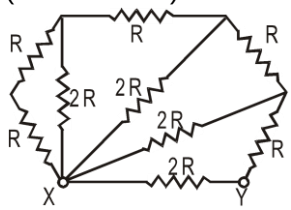
(1) 8/3 (2) 3/4 (3) 4 (4) 3

4. There are five resistances of 1 ohm each. If the initial three resistance are joined in parallel and rest two are joined in series, then the final resistance is

(1) 3 ohm (2) 8 ohm (3) 7/3 ohm (4) 5 ohm

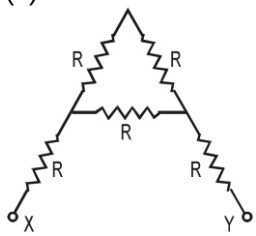
Que-5-11 For the following circuits, the equivalent resistance between X and Y in volt is

5. (Take R = 3 Ω)



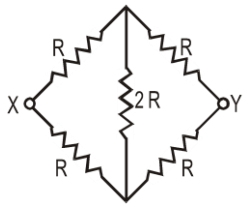
(1) R (2) 2R (3) 3R (4) R/2

6.



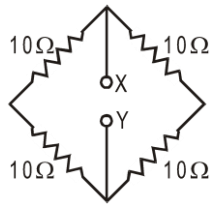
(1) 4 R (2) 8 R/3 (3) R (4) 3 R

7.



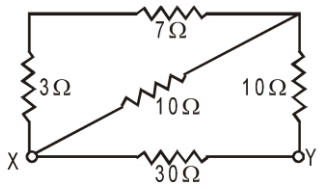
(1) R (2) 4 R (3) 5 R (4) 6 R

8.



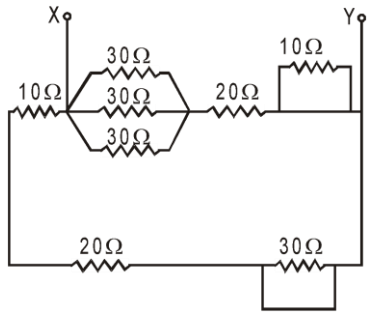
(1) 10 Ω (2) 20 Ω (3) 30 Ω (4) ∞ Ω

9.



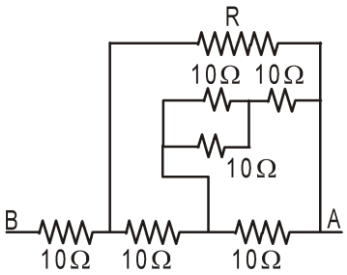
(1) 10 Ω (2) 20 Ω (3) 30 Ω (4) 40 Ω

10.



(1) 5 Ω (2) 10 Ω (3) 15 Ω (4) 60 Ω

11. For the network of resistance shown in the figure the equivalent resistance of the network between the points A and B is 18 ohm. The value of unknown resistance R is:- **[RPET-97]**



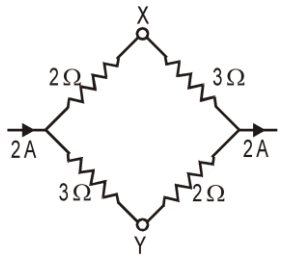
(1) 8Ω (2) 10Ω (3) 16Ω (4) 24Ω

12. If 2 bulbs rated 2.5 W – 110 V and 100 W – 110 V are connected in series to a 220 V supply then
(1) 2.5 W bulb will fuse (2) 100 W bulb will fuse
(3) both will fuse (4) both will not fuse

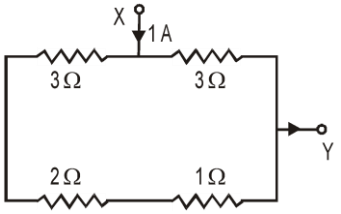
13. A 50 W bulb is in series with a room heater and the combination is connected across the mains. To get max. heater output, the 50 W bulb should be replaced by
(1) 25 W (2) 10 W (3) 100 W (4) 200 W

In the following Questions (14 to 19), find the potential difference between points X and Y.

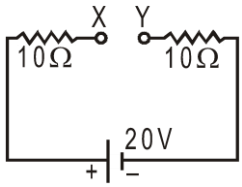
14.



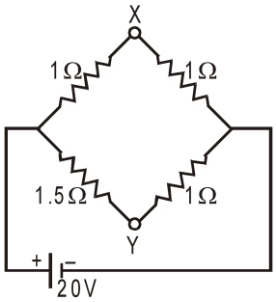
(1) 1 (2) –1 (3) 2 (4) –2

15. 

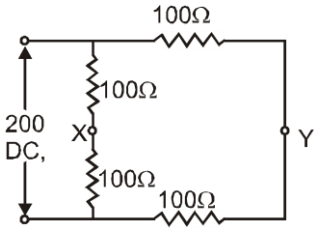
(1) 2 (2) 3 (3) 6 (4) 9

16. 

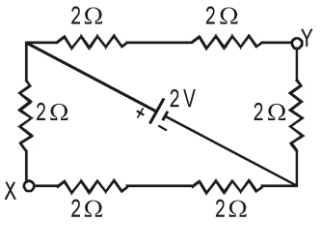
(1) 10 (2) 20 (3) 0 (4) 5

17. 

(1) 0.1 (2) 2 (3) 0.3 (4) 0.4

18. 

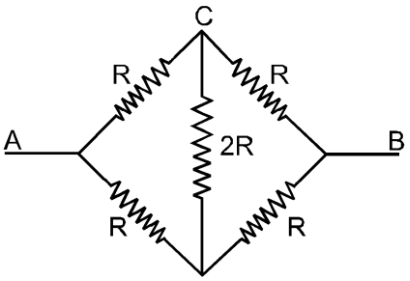
(1) 10 (2) 50 (3) 100 (4) 0

19. 

(1) 2/3 (2) 4/3 (3) 8/9 (4) 5/8

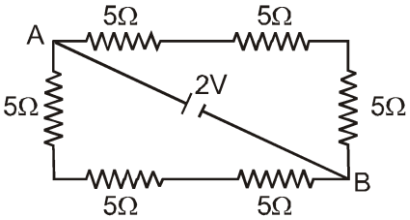
20. The resistance of P, Q, R S arms of a Wheatstone bridge are 5, 15, 20 and 60Ω. A cell of 4 volt emf and 4Ω internal resistance is connected with them, then the current flowing (in ampere) is
(1) 0.1 (2) 0.2 (3) 1 (4) 2

21. The equivalent resistance between A and B in the given circuit will be **[RPMT 2003]**



(1) R (2) 2R (3) $\frac{R}{2}$ (4) 6R

22. In a showing figure find the equivalent resistance between A and B. **[R_PMT 2002]**



(1) 2/3 ohm (2) 5/ ohm (3) 8/9 ohm (4) 7.5 ohm

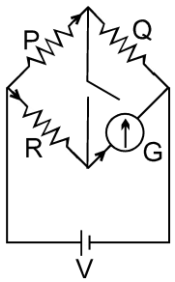
23. 40W, 100W and 200 W bulbs are connected with a source of 200 V ratings of all bulbs are also 200V. Now, they are connected in series, then which bulbs will glow more : **[R_PMT 2002]**

(1) 300 W (2) 100W (3) 40W (4) all gives same light

24. In a Wheatstone's bridge resistance of each of the four side is 10Ω. If the resistance of the galvanometer is also 10Ω, then effective resistance of the bridge will be : **[AIPMT 2001]**

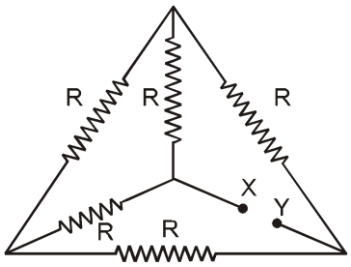
(1) 10Ω (2) 5Ω (3) 20Ω (4) 40Ω

25. In the circuit shown, P ≠ R, the reading of the galvanometer is same with switch S open or closed. Then **[JEE - 1999, 2/200]**



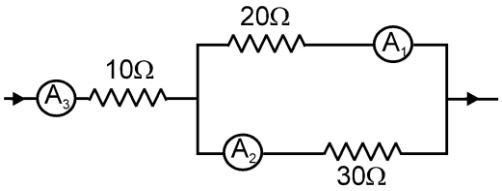
(1) $I_R = I_G$ (2) $I_P = I_G$ (3) $I_Q = I_G$ (4) $I_Q = I_R$

26. Find equilvalent resistance between X and Y : **[R-PMT 2001]**



(1) R (2) R/2 (3) 2R (4) 5R

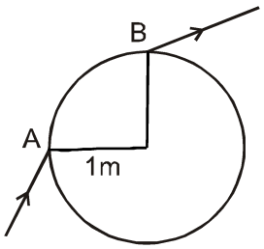
27. If the reading of ammeter A_1 in figure is 2.4 A. Neglecting the resistances of the ammeters, the reading of ammeter A_2 will be :



(1) 1.6 A (2) 1.2 A (3) 1 A (4) 2 A

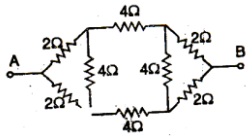
28. In the previous question the reading of ammeter A_3 will be :
(1) 1.6 A (2) 1.2 A (3) 4 A (4) 2 A

29. The wire used in the arrangement shown in figure has a resistance of r ohm per meter. The equivalent resistance between points A and B is



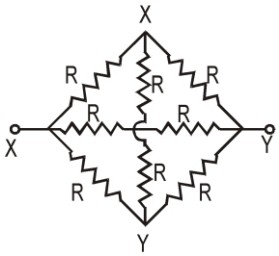
(1) $\left(\frac{6}{11}\right)r$ (2) $\frac{2\pi r}{(\pi+1)}$ (3) $\frac{6\pi r}{(16+3\pi)}$ (4) $\frac{3\pi r}{(10+3\pi)}$

30. For the circuit of figure the equivalent resistance between points A and B is



(1) 1Ω (2) 2Ω (3) 4 Ω (4) 8 Ω

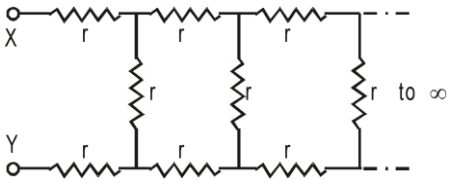
31.



(1) 2R/3 (2) R/3 (3) 2 R (4) 3 R

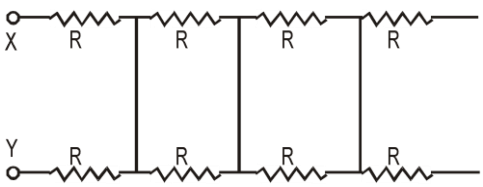
In following circuits the value of total resistance between X and Y in ohm is

32.



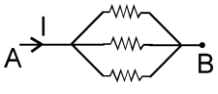
(1) $(1+\sqrt{3})R$ (2) $(\sqrt{3}-1)R$ (3) ∞ (4) 50 r

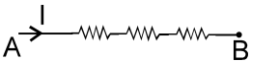
33.

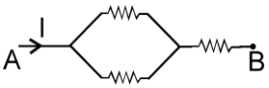


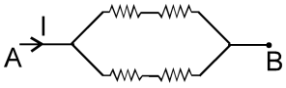
(1) R (2) 2R (3) R/2 (4) 4 R

34. Arrange the order of power dissipated in the given circuits, if the same current is passing through the system. The resistance of each resistor is 'r'. **[JEE(Scr.) - 2003, 3/84]**

(i) 

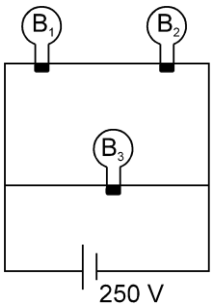
(ii) 

(iii) 

(iv) 

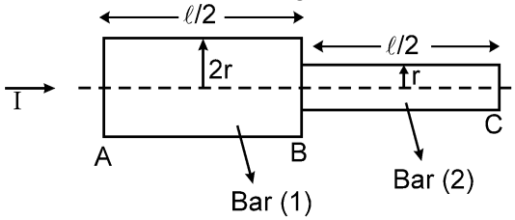
(1) $P_2 > P_3 > P_4 > P_1$ (2) $P_1 > P_4 > P_3 > P_2$ (3) $P_1 > P_2 > P_3 > P_4$ (4) $P_4 > P_3 > P_2 > P_1$

35. A 100 W bulb B_1 and two 60 W bulbs B_2 and B_3 are connected to a 250 V source as shown in the figure. Now W_1, W_2 and W_3 are the output powers of the bulbs B_1, B_2 and B_3 respectively. Then:
[JEE(Scr.) - 2002, 3/105]



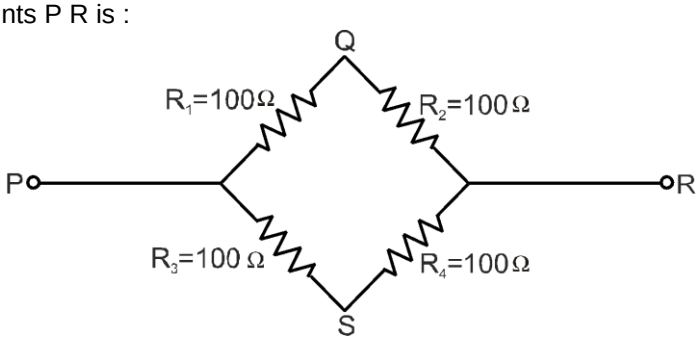
(1) $W_1 > W_2 = W_3$ (2) $W_1 > W_2 > W_3$ (3) $W_1 < W_2 = W_3$ (4) $W_1 < W_2 < W_3$

36. Two bars of equal resistivity ρ and radii 'r' and '2r' are kept in contact as shown. An electric current I is passed through the bars. Which one of the following is correct? **[JEE' 2006 ; 3/184]**



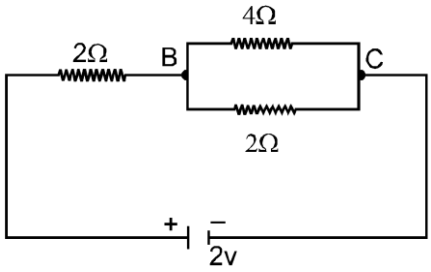
(1) Heat produced in bar (1) is 2 times the heat produced in bar (2)
(2) Electric field in both halves is equal
(3) Current density across AB is double that of across BC.
(4) Potential difference across BC is 4 times that of across AB.

37. From resistances of 100 ohm each are connected in the form of a square. The effective resistance along the diagonal points P R is : **[RPMT 2005]**



(1) 100Ω (2) 180 Ω (3) 220 Ω (4) 440 Ω

38. The potential difference across BC in the following figure will be : **[RPMT 2004]**

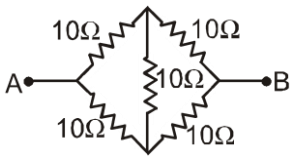


(1) 1.2 v (2) 2 v (3) 0.8 v (4) 1 v

39. For two resistance wires joined in parallel, the resultant resistance is $\frac{6}{5}\Omega$. When one of the resistance wires breaks the effective resistance becomes 2Ω. The resistance of the broken wire is **[RPMT 2007]**

(1) $\frac{3}{5}\Omega$ (2) 2Ω (3) $\frac{6}{5}\Omega$ (4) 3 Ω

40. The equivalent resistance between A and B is **[RPMT 2007]**

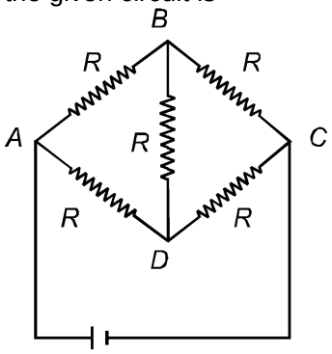


(1) 10 Ω (2) 20 Ω (3) 30 Ω (4) 40 Ω

41. Three resistance P, Q, R each of 2Ω and an unknown resistane S form the four arms of a Wheatstone's bridge circuit. When a resistane of 6 Ω is connected in parallel to S the bridge gets balanced. What is the value of S ? **[RPMT 2008]**

(1) 2 Ω (2) 3 Ω (3) 6 Ω (4) 1 Ω

42. Equivalent resistance of the given circuit is **[RPMT 2009]**

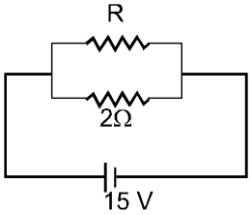


(1) R (2) R/2 (3) R/4 (4) R/6

43. Two metal wired having conductivities σ_1 and σ_2 respectively have same dimensions. If they are connected in series the effective conductivity of the combination is **[RPMT-2014]**

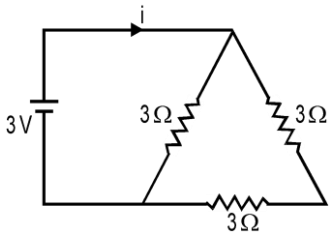
(1) $\frac{\sigma_1+\sigma_2}{2}$ (2) $\frac{\sigma_1-\sigma_2}{2}$ (3) $\frac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$ (4) $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

44. If in the circuit, power dissipation is 150 W then R is **[AIEEE 2002, 4/300]**



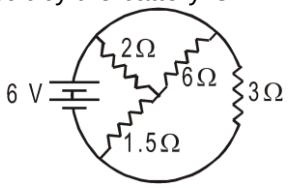
(1) 2 Ω (2) 6 Ω (3) 5 Ω (4) 4 Ω

45. A 3 volt battery with negligible internal resistance is connected in a circuit as shown in the figure. Current i will be : **[AIEEE 2003, 4/300]**



(1) 1/3 A (2) 1 A (3) 1.5 A (4) 2 A

46. The total current supplied to the circuit by the battery is : **[AIEEE 2004, 4/300]**



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

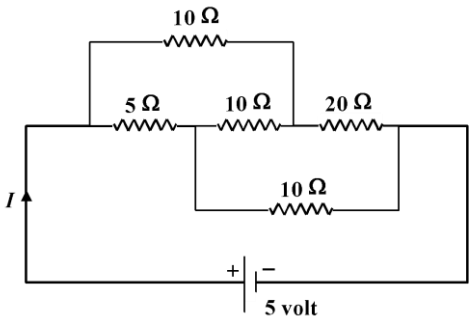
47. The resistance of the series combination of two resistances is S. When they are joined in parallel, the total resistance is P. If S = nP, then the minimum possible value of n is : **[AIEEE 2004, 4/300]**

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

48. An electric current is passed through a circuit containing two wires of the same material, connected in parallel. If 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, 4/300]**

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

49. The current I drawn from the 5 volt source will be **[AIEEE 2006, 3/180]**



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

50. In a Wheat stone'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, 3/180]**

(1) $\frac{P}{Q}=\frac{R(S_1+S_2)}{2S_1S_2}$ (2) $\frac{P}{Q}=\frac{R}{S_1+S_2}$ (3) $\frac{P}{Q}=\frac{2R}{S_1+S_2}$ (4) $\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$

51. For a cell the terminal potential difference is 2.2V when circuit is open and reduces to 1.8V when cell is connected to a resistance R = 5Ω, the internal resistance (r) of cell is : **[AIPMT 2002]**

(1) $\frac{10}{9}$ Ω (2) $\frac{9}{10}\Omega$ (3) $\frac{11}{9}\Omega$ (4) $\frac{5}{9}\Omega$

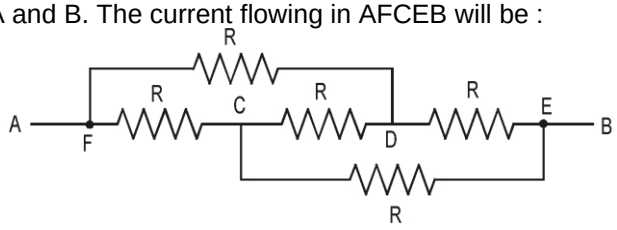
52. In a Wheatstone's bridge all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is : **[AIPMT 2003]**

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

53. Resistances n, each of r ohm, when connected in parallel given an equivalent resistance of R ohm. If these resistances were connected in series, the combination would have a resistance in ohms, equal to: **[AIPMT 2004]**

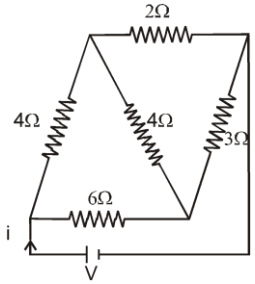
(1) n^2R (2) R/n^2 (3) R/n (4) nR

54. Five equal resistances each of resistance R are connected as shown in the figure. A battery of V volts is connected between A and B. The current flowing in AFCEB will be : **[AIPMT 2004]**



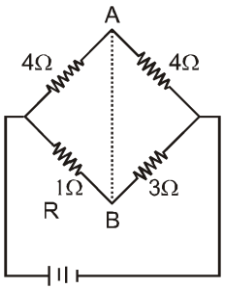
(1) $\frac{3V}{R}$ (2) $\frac{V}{R}$ (3) $\frac{V}{2R}$ (4) $\frac{2V}{R}$

55. For the network shown in the figure, the value of the current i is : **[AIPMT 2005]**



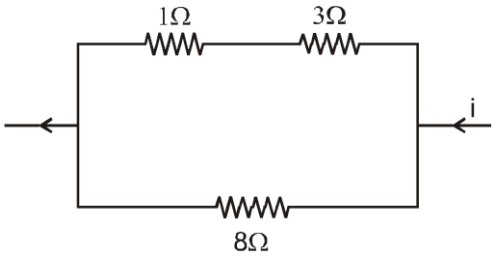
(1) $\frac{9V}{35}$ (2) $\frac{5V}{18}$ (3) $\frac{5V}{9}$ (4) $\frac{18V}{5}$

56. In the circuit shown, if a conducting wire is connected between points A and B, the current in this wire will :- **[AIPMT 2006]**



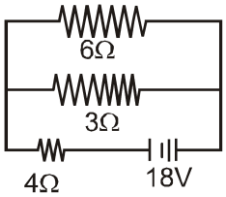
(1) Flow from A to B (2) Flow in the direction which will be decided by the value of V
(3) Be zero (4) Flow from B to A

57. Power dissipated across the 8Ω resistor in the circuit shown here is 2 watt. The power dissipated in watt units across the 3Ω resistor is :- **[AIPMT 2006]**



(1) 2.0 (2) 1.0 (3) 0.5 (4) 3.0

58. The total power dissipated in watts in the circuit shown here is :- **[AIPMT 2007]**

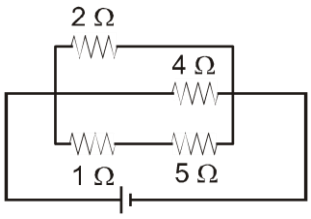


(1) 4W (2) 16W (3) 40W (4) 54W

59. Three resistances P, Q, R each of 2Ω and an unknown resistance S form the four arms of a Wheatstone bridge circuit, When a resistance of 6Ω is connected in parallel to S the bridge gets balanced. What is the value of S ? **[AIPMT 2007]**

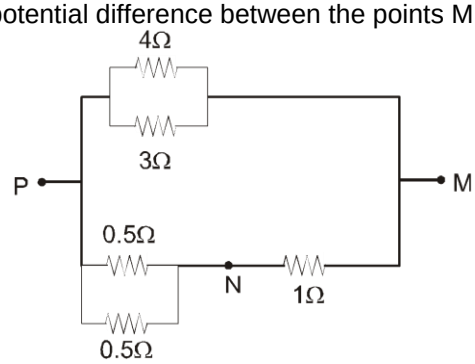
(1) 1Ω (2) 2Ω (3) 3Ω (4) 6Ω

60. A current of 3 A flows through the 2Ω resistor shown in the circuit. The power dissipated in the 5Ω resistor is **[AIPMT 2008]**



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

61. In the circuit shown, the current through the 4Ω resistor is 1 A when the points P and M are connected to a DC voltage source. The potential difference between the points M and N is **[AIPMT 2008]**



(1) 1.5 V (2) 1.0 V (3) 0.5 V (4) 3.2 V

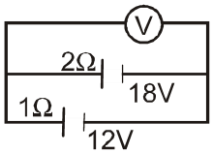
SECTION (E) : COMBINATION OF CELLS

1. Two nonideal batteries are connected in parallel. Consider the following statements
(I) The equivalent emf is smaller than either of the two emfs.
(II) The equivalent internal resistance is smaller than either of the two internal resistance.

(1) Both I and II are correct (2) I is correct but II is wrong
(3) II is correct but I is wrong (4) Each of I and II is wrong.

2. 12 cells each having the same emf are connected in series and are kept in a closed box. Some of the cells are wrongly connected. This battery is connected in series with an ammeter and two cells identical with each other and also identical with the previous cells. The current is 3 A when the external cells aid this battery and is 2 A when the cells oppose the battery. How many cells in the battery are wrongly connected?
(1) one (2) two (3) three (4) none

3. Two batteries, one of emf 18V and internal resistance 2Ω and the other of emf 12 V and internal resistance 1Ω, are connected as shown. The voltmeter V will record a reading of :**[AIPMT 2005]**

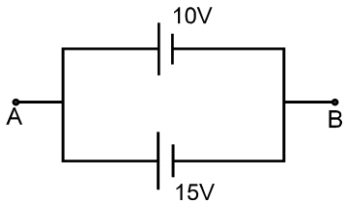


(1) 15V (2) 30 V (3) 14 V (4) 18 V

4. n equal cell having e.m.f. E and internal resistance r, are connected in circuit of a resistance R. Same current flows in circuit either they connected in series or parallel, if : **[R_PMT 2002]**

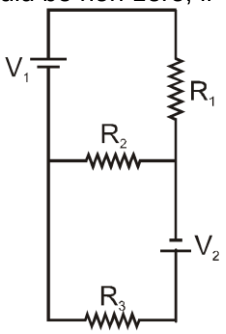
(1) R = nr (2) R = $\frac{r}{n}$ (3) R = $n_2 r$ (4) R = r

5. Two cells of e.m.f. 10 V & 15 V are connected in parallel to each other between points A & B. The cell of e.m.f. 10 V is ideal but the cell of e.m.f. 15 V has internal resistance 1 Ω. The equivalent e.m.f. between A and B is:



(1) $\frac{25}{2}$ V (2) not defined (3) 15 V (4) 10 V

6. Two ideal batteries of emf V_1 and V_2 and three resistances R_1, R_2 and R_3 are connected as shown in the figure. The current in resistance R_2 would be non-zero, if **[JEE (Advanced)-2014,P-1, 3/60]**



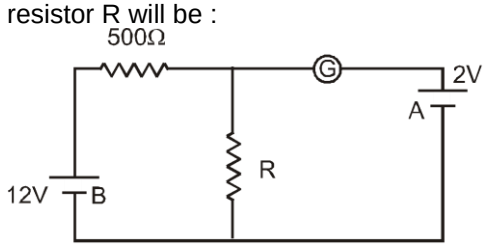
(1) $V_1 = V_2$ and $R_1 = R_2 = R_3$ (2) $V_1 = V_2$ and $R_1 = 2R_2 = R_3$
(3) $V_1 = 2V_2$ and $2R_1 = 2R_2 = R_3$ (4) $2V_1 = V_2$ and $2R_1 = R_2 = R_3$

7. Two non-ideal batteries are connected in parallel. Consider the following statements. **[R_PMT 2008]**
(i) The equivalent emf is smaller than either of the two emfs.
(ii) The equivalent internal resistane is smaller than either of the two internal resistances.
(1) Both (i) and (ii) are correct (2) (i) correct but (ii) is wrong
(3) (ii) is correct but (i) is wrong (4) Both (i) and (ii) are wrong

8. 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 internal resistance R_2, is zero, then: **[AIEEE 2005, 4/300]**

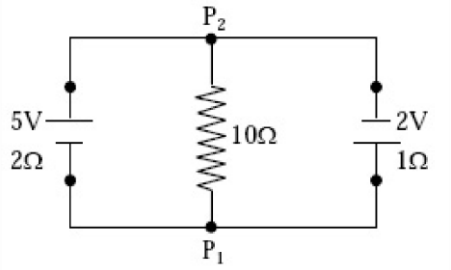
(1) $R = \frac{R_2 \times (R_1 + R_2)}{(R_2 - R_1)}$ (2) $R = R_2 - R_1$ (3) $R = \frac{R_1 R_2}{(R_2 + R_1)}$ (4) $R = \frac{R_1 R_2}{(R_2 - R_1)}$

9. 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, 4/300]**



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

10. A 5 V battery with internal resistance 2 Ω and a 2V battery with internal resistance 1Ω are connected to a 10Ω resistor as shown in the figure. **[AIEEE 2008, 3/105]**



The current in the 10 Ω resistor is -

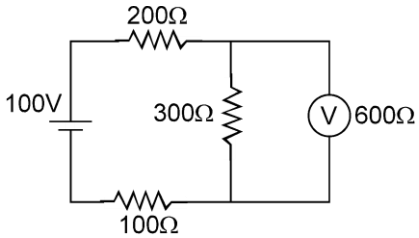
(1) 0.03 A P_1 to P_2 (2) 0.03 A P_2 to P_1 (3) 0.27 A P_1 to P_2 (4) 0.27 A P_2 to P_1

11. Two cells, having the same e.m. f., are connected in series through an external resistance R. Cells have internal resistances r_1 and r_2 ($r_1 > r_2$) respectively. When the circuit is closed, the potential difference across the first cell is zero. The value of R is :- **[AIPMT 2006]**

(1) $r_1 - r_2$ (2) $\frac{r_1 + r_2}{2}$ (3) $\frac{r_1 - r_2}{2}$ (4) $r_1 + r_2$

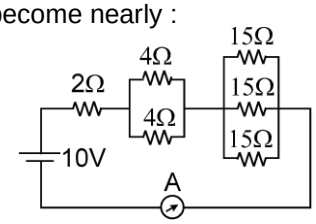
SECTION (F) : INSTRUMENT

1. The reading of voltmeter is



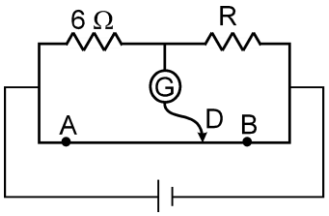
(1) 50V (2) 60 V (3) 40V (4) 80 V

2. The current through the ammeter shown in figure is 1 A. If each of the 4Ω resistor is replaced by 2Ω resistor, the current in circuit will become nearly :



(1) $\frac{10}{9}$ A (2) $\frac{5}{4}$ (3) $\frac{9}{8}$ A (4) $\frac{9}{8}$ A

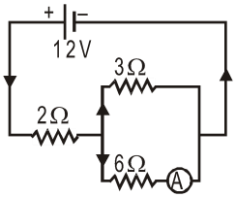
3. The meter-bridge wire AB shown in figure is 50 cm long. When AD = 30 cm, no deflection occurs in the galvanometer. Find R.



(1) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω

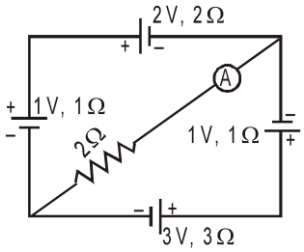
Reading of ammeter in ampere for the following circuit is **(Q. 4 to 6)**

4.



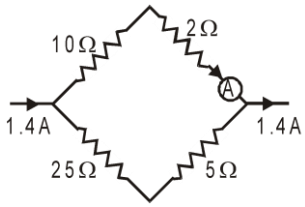
(1) 4 (2) 3 (3) 1 (4) 2

5.



(1) 2/15 (2) 1/13 (3) 2/11 (4) 2/17

6.



(1) 0.4 (2) 1 (3) 0.6 (4) 1.2

7. The potential gradient of a potentiometer wire is defined as
(1) the fall of potential per unit length (2) the fall of potential per unit area
(3) the fall in potential across the ends of wires (4) None of the above

8. The unit of potential gradient is
(1) volt (2) volt/ampere (3) volt/meter (4) volt x meter

9. The length of the potentiometer wire is kept larger so that the value of potential gradient may
(1) increase (2) decrease
(3) remain uniform all over the length of its wire (4) none of the above

10. For the same potential difference, a potentiometer wire is replaced by another one of a high specific resistance. The potential gradient then ($r = R_h = 0$)
(1) decreases (2) remains same (3) increases (4) data is incomplete

11. If the current in a potentiometer increases, the position of the null point will
(1) be obtained at a larger length than the previous one
(2) be equal to the previous length
(3) be obtained at a smaller length than the previous
(4) None of the above

12. The sensitivity of a potentiometer is increased by
(1) increasing the emf of the cell (2) increasing the length of potentiometer wire
(3) decreasing the length of potentiometer wire (4) None of the above

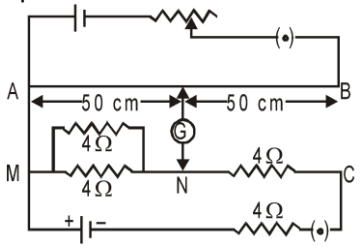
13. In a potentiometer wire, whose resistance is 0.5 ohm/m, a current of 2 ampere is passing. The value of potential gradient in volt/m will be
(1) 0.1 (2) 0.5 (3) 1.0 (4) 4

14. The potentiometer wire 10 m long and 20 ohm resistance is connected to a 3 volt emf battery and a 10 ohm resistance. The value of potential gradient in volt/m of the wire will be
(1) 1.0 (2) 0.2 (3) 0.1 (4) 0.02

15. The potential gradient of potentiometer is 0.2 volt/m. A current of 0.1 amp is flowing through a coil of 2 ohm resistance. The balancing length in meters for the p.d. at the ends of this coil will be
(1) 2 (2) 1 (3) 0.2 (4) 0.1

16. The emf of a standard cell is 1.5 volt and its balancing length is 7.5 m. The balancing length in meters for a 3.5 ohm resistance, through which a current of 0.2 A, flows will be
(1) 3.5 (2) 5.0 (3) 5.7 (4) 6.5

17. In the following figure, the p.d. between the points M and N is balanced at 50 cm length. The balancing length in cm, for the p.d. between points N and C will be



(1) 40 (2) 100 (3) 75 (4) 25

18. Potentiometer measures **[RPMT 2004]**
(1) potential difference (2) internal resistance (3) current (4) external resistance

19. The resistance of an ideal voltmeter is ; **[RPMT 2004]**
(1) very low (2) infinite (3) zero (4) none of these

20. For changing an ammeter into a voltmeter, we should connect **[RPMT 2003]**
(1) low resistance in series (2) low resistance in parallel
(3) high resistance in series (4) high resistance in parallel

21. When a cell is balanced on potentiometer wire, then balancing length is 125 cm. If resistance of 2 ohm is connected across the ends of cell, then balancing length is 100 cm, then internal resistance of cell is : **[RPMT 2001]**
(1) 0.5 Ω (2) 0.25 Ω (3) 0.05 Ω (4) 5 Ω

22. Potentiometer measure the potential difference more accurately than a voltmeter because: **[AIPMT 2000]**
(1) It has a wire of high resistance. (2) It has a wire of low resistance
(3) It does not draw current from external circuit (4) It draws a heavy current from external circuit

23. For which of the following meters, converted from identical galvanometers, the resistance of the converted meter is largest
(1) voltmeter of range 0.5 V (2) ammeter of range 1 A

(3) Voltmeter of range 1.0 V (4) ammeter of range 10 A

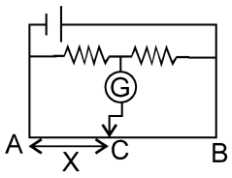
24. Resistivity of potentiometer wire is 10^{-7} ohm-metre and its area of cross-section is $10^{-6}m^2$. When a current i = 0.1A flows through the wire, its potential gradient is : **[AIPMT 2001]**
(1) 10^{-2} V/m (2) 10^{-4} V/m (3) 0.1 V/m (4) 10V/m

25. In electrolysis the mass deposited on an electrode is directly proportional to : **[AIPMT 2000]**
(1) Current (2) Square of current
(3) Concentration of solution (4) Inverse of current

26. The material of wire of potentiometer is **[MP PMT 2002]**
(1) Copper (2) Steel (3) Manganin (4) Aluminium

27. An ammeter and a voltmeter are joined in series to a cell. Their readings are A and V respectively. If a resistance is now joined in parallel with the voltmeter,
(1) both A and V will increase (2) both A and V will decrease
(3) A will decrease, V will increase (4) A will increase, V will decrease

28. In the given circuit, no current is passing through the galvanometer. If the cross-sectional diameter of the wire AB is doubled, then for null point of galvanometer, the value of AC would be:
[JEE(Scr.) - 2003, 3/84]



(1) 2 X (2) X (3) $\frac{X}{2}$ (4) None

29. A galvanometer can be changed into ammeter by connecting : **[R_PMT 2005]**
(1) high resistance in parallel (3) high resistance in series.
(3) low resistance in parallel (4) low resistance in series

30. Sensitivity of potentiometer can be increased by **[R_PMT 2009]**
(1) increasing the emf of the cell
(2) increasing the length of the potentiometer wire
(3) decreasing the length of the potentiometer wire
(4) None of the above

31. The material of wire of potentiometer is **[R_PMT 2009]**
(1) copper (2) steel (3) manganin (4) aluminium

32. If an ammeter is to be used in place of a voltmeter then we must connect with the ammeter a **[AIEEE 2002, 4/300]**
(1) Low resistance in parallel (2) High resistance in parallel
(3) High resistance in series (4) Low resistance in series

33. An ammeter reads upto 1 ampere. Its internal resistance is 0.81 ohm. To increase the range to 10 A the value of the required shunt is **[AIEEE 2003, 4/300]**
(1) 0.09 Ω (2) 0.03 Ω (3) 0.3 Ω (4)0.9 Ω

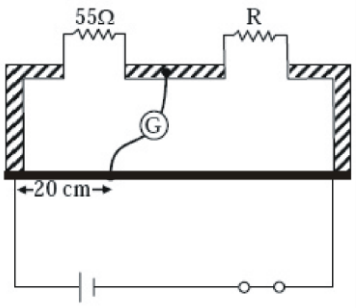
34. The length of a wire of a potentiometer is 100 cm, and the emf of its standard cell is E volt. It is employed to measure the emf of a battery whose internal resistance is 0.5 ohm. If the balance point is obtained at 30 cm from the positive end, the emf of the battery is **[AIEEE 2003, 4/300]**
(1) $\frac{30E}{100}$ (2) $\frac{30E}{100.5}$ (3) $\frac{30E}{(100-0.5)}$
(4) $\frac{30(E-0.5i)}{100}$, $\frac{30(E-0.5i)}{100}$, where i is the current in the potentiometer

35. 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, 4/300]**
(1) 50 cm (2) 80 cm (3) 40 cm (4) 70 cm

36. 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, 4/300]**
(1) 1 Ω (2) 0.5 Ω (3) 4 Ω (4) 2 Ω

37. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milli ampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be : **[AIEEE 2005, 4/300]**
(1) 10^3 (2) 10^5 (3) 99995 (4) 9995

38. Shown in the figure below is a meter-bridge set up with null deflection in the galvanometer. **[AIEEE 2008, 3/105]**



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

39. To convert a galvanometer into a voltmeter, one should connect a : **[AIPMT 2002]**
(1) High resistance in series with galvanometer (2) Low resistance in series with galvanometer
(3) High resistance in parallel with galvanometer (4) Low resistance in parallel with galvanometer

40. A galvanometer of 50Ω resistance has 25 divisions. A current of 4×10^{-4} A gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25V, it should be connected with a resistance of : **[AIPMT 2004]**
(1) 2500Ω as a shunt (2) 245Ω as a shunt (3) 2550Ω in series (4) 2450Ω in series

41. A galvanometer acting as a voltmeter will have : **[AIPMT 2004]**
(1) A high resistance in parallel with its coil (2) A high resistance in series with its coil
(3) A low resistance in parallel with its coil (4) A low resistance in series with its coil

42. The resistance of an ammeter is 13Ω and its scale is graduated for a current upto 100 amps. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 amperes by this meter. The value of shunt-resistance is :- **[AIPMT 2007]**
(1) 20Ω (2) 2Ω (3) 0.2 Ω (4) 2kΩ

43. A galvanometer of resistance 50Ω is connected to a battery of 3 V along with a resistance of 2950 Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be **[AIPMT 2008]**
(1) 5050 Ω (2) 5550 Ω (3) 6050 Ω (4) 4450 Ω

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 **[AIPMT 2008]**
(1) 1.0 Ω (2) 0.5 Ω (3) 2.0 Ω (4) zero

Exercise-2

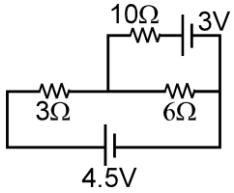
1. A quantity X is given by $\varepsilon_0 L \frac{\Delta V}{\Delta t}$ where ε_0 is the permittivity of free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensional formula for X is the same as that of : **[JEE (Scr.) 2001, 3/105]**

(1) Resistance (2) Charge (3) Voltage (4) Current

2. When a current flows through a conductor its temperature **[MHCET 2002]**

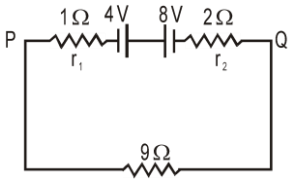
(1) May increase or decrease (2) Remains same
(3) Decreases (4) Increases

3. Find the current through the 10 Ω resistor shown in figure



(1) zero (2) 1 A (3) 2A (4) 5 A

4. Two batteries of e.m.f. 4 V and 8 V with internal resistances 1 Ω and 2 Ω are connected in a circuit with a resistance of 9 Ω as shown in figure. The current and potential difference between the points P and Q are **[AFMC 1999]**

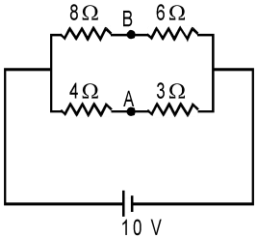


(1) 1/3 A 3 V (2) 1/6 A 4 V (3) 1/9 A 9 V (4) 1/2 A 12 V

5. For driving a current of 2 A for 6 minutes in a circuit, 1000 J of work is to be done. The e.m.f. of the source in the circuit is **[CPMT 1999]**

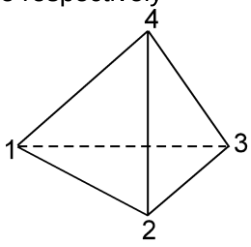
(1) 1.38 V (2) 1.68 V (3) 2.04 V (4) 3.10 V

6. The potential difference between point A and B is **[BHU 2003]**



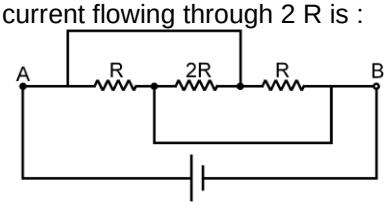
(1) $\frac{20}{7}$V (2) $\frac{40}{7}$V (3) $\frac{10}{7}$V (4) 0

7. A wire is in the form of a tetrahedron. The resistance of each edge is r. The equivalent resistances between corners 1–2 and 1–3 are respectively



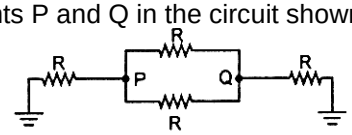
(1) $\frac{r}{2},\frac{r}{2}$ (2) r, r (3) $\frac{r}{2}$,r (4) r, $\frac{r}{2}$

8. In the figure shown the current flowing through 2 R is :



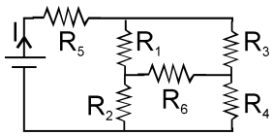
(1) from left to right (2) from right to left (3) no current (4) None of these

9. The net resistance between points P and Q in the circuit shown in fig. is



(1) R/2 (2) 2R/5 (3) 3R/5 (4) R/3

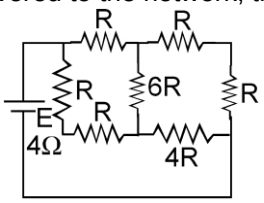
10. In the given circuit, it is observed that the current I is independent of the value of the resistance R_6. Then the resistance values must satisfy: **[JEE(Scr.) - 2001,3/105]**



(1) $R_1 R_2 R_5 = R_3 R_4 R_6$ (2) $\frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{R_1 + R_2} + \frac{1}{R_3 + R_4}$

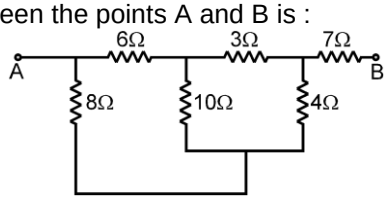
(3) $R_1 R_4 = R_2 R_3$ (4) $R_1 R_3 = R_2 R_4 = R_5 R_6$

11. A battery of internal resistance 4 ohm is connected to the network of resistance as shown. In the order that the maximum power can be delivered to the network, the value of R in ohm should be:**[JEE - 1995]**



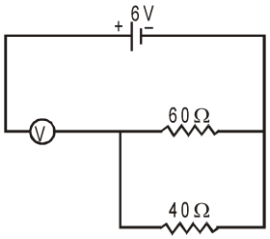
(1) 4/9 (2) 2 (3) 8/3 (4) 18

12. The equivalent resistance between the points A and B is :



(1) $\frac{36}{7}$ Ω (2) 10 Ω (3) $\frac{85}{7}$ Ω (4) none of these

13. The measurement (approx) of ideal voltmeter in the following circuit is **[AFMC 2001]**

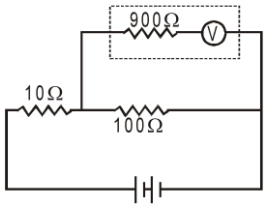


(1) 2.4 V (2) 3.4 V (3) 4.0 V (4) 6.0 V

14. A cell is balanced at 100 cm of a potentiometer wire when the total length of the wire is 400 cm. If the length of the potentiometer wire is increased by 100 cm, then the new balancing length for the cell will be (Assume pd across potentiometer wire is constant)

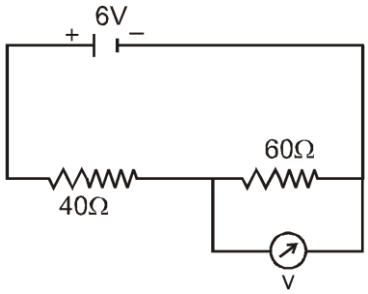
(1) 100 cm (2) 125 cm (3) 80 cm (4) 250 cm

15. The potential difference across the 100 ohm resistance in the following circuit is measured by a voltmeter of 900 ohm resistance. The percentage error made in reading the potential difference is **[AMU (Med.) 2002]**



(1) 10/9 (2) 0.1 (3) 1.0 (4) 10.0

16. The reading of voltmeter in the circuit shown is **[RPMT 2003]**



(1) 3.6 V (2) 3.25 V (3) 4.25 V (4) 6.25 V

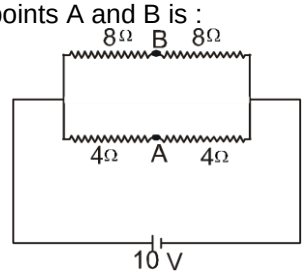
17. One filament takes 10 min to heat a kettle and another takes 15 min. If connected in parallel they combindly take..... min to heat the same kettle : **[R_PMT 2006]**

(1) 6 (2) 12.5 (3) 25 (4) 7.5

18. Five resistances of resistance RΩ are there, 3 are connected in parallel and are joined to them in series. Find resultant resistance : **[RPMT 2006]**

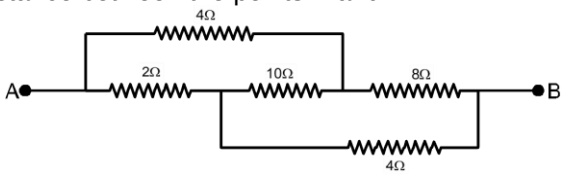
(1) $\left(\frac{3}{7}\right)$ R Ω (2) $\left(\frac{7}{3}\right)$ R Ω (3) $\left(\frac{7}{8}\right)$ R Ω (4) $\left(\frac{8}{7}\right)$ R Ω

19. The potential difference between points A and B is : **[RPMT 2006]**



(1) $\frac{20}{7}$ V (2) $\frac{40}{7}$ V (3) $\frac{10}{7}$ V (4) zero

20. Find the equivalent resistance between the points A and B : **[RPMT 2006]**



(1) 2Ω (2) 4 Ω (3) 8 Ω (4) 16 Ω

21. A circuit consists of five identical conductors as shown in figure. The two similar conductors are added as indicated by dotted lines. The ratio of resistances before and after addition will be **[R-PMT 2007]**

(1) $\frac{7}{5}$ (2) $\frac{3}{5}$ (3) $\frac{5}{3}$ (4) $\frac{6}{5}$

22. The electric current passes through a metallic wire produces heat because of **[R_PMT 2007]**
(1) collisions of conduction electrons with each other
(2) collisions of the atoms of the metal with each other
(3) the energy released in the ionization of the atoms of the metal
(4) collisions of the conduction electrons with the atoms of the metallic wire

23. An electrical cable of copper has just one wire of radius 9 mm. Its resistance is 5 Ω. The single wire of the cable is replaced by 6 different well insulated copper wires each of radius 3 mm. The total resistance of the cable will now be equal to **[R-PMT 2007]**
(1) 270 Ω (2) 90 Ω (3) 45 Ω (4) 7.5 Ω

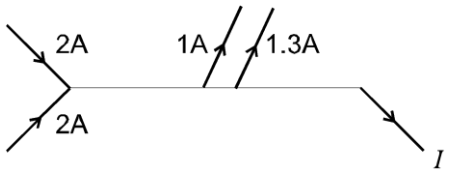
24. A galvanometer has resistance of 400 Ω and deflects full scale for current of 0.2 mA through it. The shunt resistance required to convert it into 3 A ammeter is **[RPMT 2007]**
(1) 0.027 Ω (2) 0.054 Ω (3) 0.0135 Ω (4) none of these

25. The resistance of an ammeter is 13 Ω and its scale is graduated for a current upto 100 A. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 A by this meter. The value of shunt resistance is **[RPMT 2008]**
(1) 20 Ω (2) 2 Ω (3) 0.2 Ω (4) 2kΩ

26. The length of a wire in 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 **[RPMT 2008]**
(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) $\frac{30E}{100}$

27. An ammeter reads upto 1A. Its internal resistance is 0.81 Ω. To increase the range to 10 A the value of the required shunt is **[RPMT 2008]**
(1) 0.03 Ω (2) 0.3 Ω (3) 0.9 Ω (4) 0.09 Ω

28. The value of current I in the circuit will be **[RPMT 2009]**

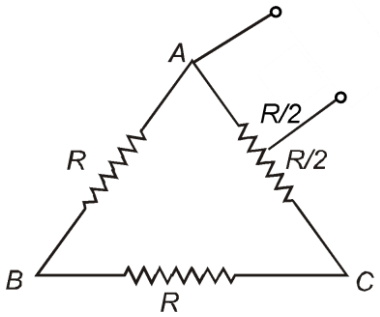


(1) 1.7 A (2) 2.1 A (3) 3 A (4) zero

29. There is a voltameter in a circuit. In order to triple its range, the resistance of how much value should be used? **[RPMT 2009]**

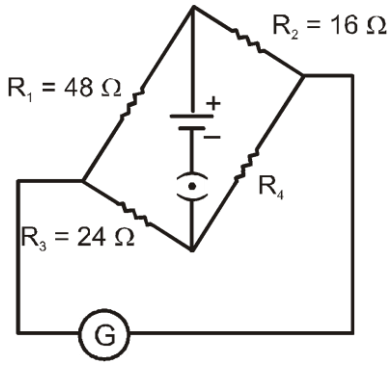
(1) 2R (2) R/2 (3) 3R (4) 4R

30. A wire is bent in the form of a triangle now the equivalent resistance R between its one end and the mid point of the side is **[RPMT 2009]**



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

31. A 'Wheatstone Bridge' circuit has been set up as shown. The resistor R_4 is an ideal carbon. The resistor R_4 is an ideal carbon resistance (tolerance = 0%) having bands of colours black, yellow and brown marked on it. The galvanometer, in this circuit, would show a 'null point' when another ideal carbon resistance X is connected across R_4, having bands of colours **[RPMT-2014]**



(1) black, brown, black, is put in parallel with R_4
(2) black, brown, brown, is put in parallel with R_4
(3) brown, black, brown, is put in parallel with R_4
(4) black, brown, black, is put in parallel with R_4

Exercise-3

PART - I : NEET / AIPMT QUESTION (PREVIOUS YEARS)

1. A galvanometer having a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 A passes through it. It can be converted into an ammeter to read currents upto 5.0 A by **[AIPMT 2009]**

(1) putting in parallel a resistance of 240 Ω (2) putting in series a resistance of 15 Ω
(3) putting in series a resistance of 240 Ω (4) putting in parallel a resistance of 15 Ω

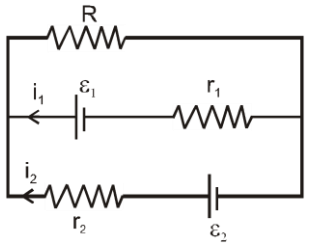
2. A wire of resistance $12\Omega m^{-1}$ is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure, is **[AIPMT 2009]**

(1) 0.6π Ω (2) 3 Ω (3) 6π Ω (4) 6Ω

3. A student measures the termainal potential diffrerence (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 **[AIPMT 2009]**

(1) ε and–r (2) –r and ε (3) r and –ε (4) –ε and r

4. See the electrical circuit shown in this figure. Which of the following equations is a correct equation for it? **[AIPMT 2009]**

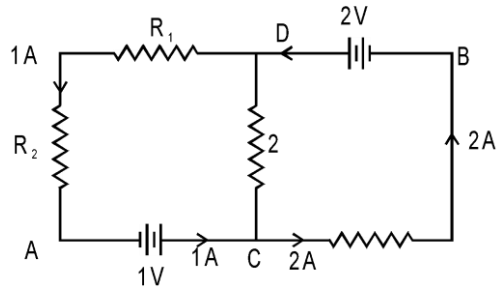


(1) $\varepsilon_1 - (i_1 + i_2)R - i_1r_1 = 0$ (2) $\varepsilon_2 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$ (3) $-\varepsilon_2 - (i_1 + i_2)R + i_2r_2 = 0$ (4) $\varepsilon_1 - (i_1 + i_2)R + i_1r_1 = 0$

5. A thermocouple of negligible resistance produces an e.m.f. of 40 μV/°C in the linear range of temperature. A galvanometer of resistance 10 ohm whose sensitivity is 1μA/div, is employed with the termocouple. The smallest value of temperature difference that can be detected by the system will be : **[AIPMT (MAINS) 2011]**

(1) 0.5°C (2) 1°C (3) 0.1°C (4) 0.25°C

6. In the circuit shown in the figure, if potential at point A is taken to be zero the potential at point B is : **[AIPMT (MAINS) 2011]**

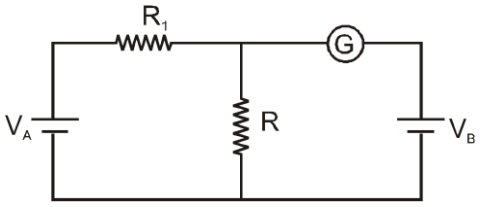


(1) –1V (2) + 2V (3) – 2V (4) + 1V

7. A milli voltmeter of 25 milli volt range is to be converted into an ammeter of 25 ampere range. The value (in ohm) of necessary shunt will be : **[AIPMT_Pre_2012]**

(1) 0.001 (2) 0.01 (3) 1 (4) 0.05

8. In the circuit shown the cells A and B have negligible resistances. For $V_A = 12V$, $R_1 = 500\Omega$ and $R = 100\Omega$ the galvanometer (G) shows no deflection. The value of V_B is : **[AIPMT_Pre_2012]**

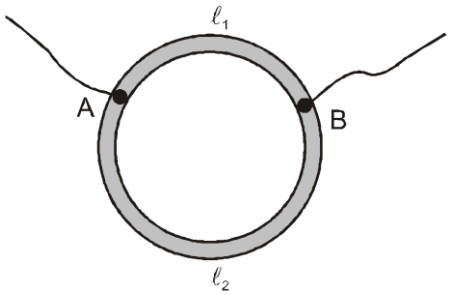


(1) 4V (2) 2V (3) 12V (4) 6V

9. If voltage across a bulb rated 220 Volt - 100 Watt drops by 2.5 % of its rated value, the percentage of the rated value by which the power would decrease is : **[AIPMT_Pre_2012]**

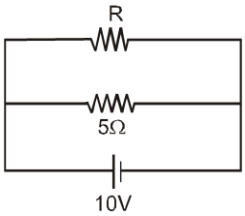
(1) 20 % (2) 2.5 % (3) 5 % (4) 10 %

10. A ring is made of a wire having a resistance $R_0 = 12\ \Omega$. Find the points A and B as shown in the figure, at which a current carrying conductor should be connected so that the resistance R of the sub circuit between these points is equal to $\frac{8}{3}\Omega$. **[AIPMT_Pre_2012]**



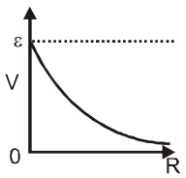
(1) $\frac{\ell_1}{\ell_2}=\frac{5}{8}$ (2) $\frac{\ell_1}{\ell_2}=\frac{1}{3}$ (3) $\frac{\ell_1}{\ell_2}=\frac{3}{8}$ (4) $\frac{\ell_1}{\ell_2}=\frac{1}{2}$

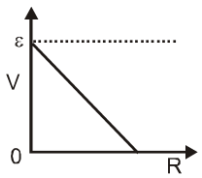
11. The power dissipated in the circuit shown in the figure is 30 Watts. The value of R is : **[AIPMT 2012 (Mains)]**

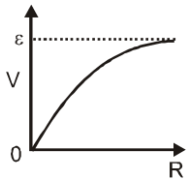


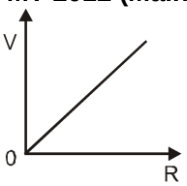
(1) 20 Ω (2) 15 Ω (3) 10 Ω (4) 30 Ω

12. Cell having an emf ε and internal resistance r is connected across a variable external resistance R .As the resistance R is increased, the plot of potential difference V across R is given by : **[AIPMT 2012 (Mains)]**

(1) 

(2) 

(3) 

(4) 

13. A wire of resistance 4 Ω is stretched to twice its original length. The resistance of stretched wire would be : **[NEET_2013]**

(1) 4 Ω (2) 8 Ω (3) 16 Ω (4) .2 Ω

14. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is :: **[NEET-2013]**

(1) 0.5 Ω (2) 0.8 Ω (3) 1.0 Ω (4) 0.2 Ω

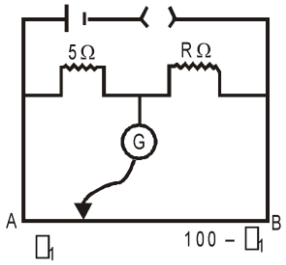
15. The resistances of the four arms P, Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 Volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be : **[NEET_2013]**

(1) 0.2 A (2) 0.1 A (3) 2.0 A (4) 1.0 A

16. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5Ω The power loss in the wire is: **[AIPMT-2014]**

(1) 19.2 W (2) 19.2 kW (3) 19.2 J (4) 12.2 kW

17. The resistance in the two arms of the meter bridge are 5Ω and R Ω, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at $1.6\ell_1$. The resistance 'R' is : **[AIPMT-2014]**



(1) 10Ω (2) 15 Ω (3) 20 Ω (4) 25 Ω

18. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance, R, connected acrose the given cell, has values of. **[AIPMT-2014]**

(i) infinity (ii) 9.5Ω

The 'balancing lengths, on the potentiometer wire are found to be 3m and 2.85 m, respectively.
The value of internal resistance of the cell is :

(1) 0.25 Ω (2) 0.95 Ω (3) 0.5 Ω (4) 0.75 Ω

19. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be : **[AIPMT-2014]**

(1) $\frac{1}{499}G$ (2) $\frac{499}{500}G$ (3) $\frac{1}{500}G$ (4) $\frac{500}{499}G$

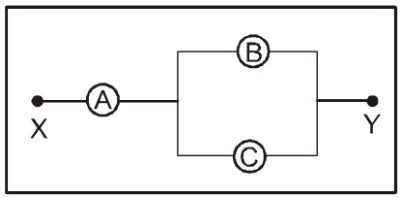
20. Across a metallic conductor of non-uniform cross section a constant potensial difference is applied. The quantity which remains constant along the conductor is **[AIPMT-2015]**

(1) current (2) drift velocity (3) electric field (4) current density

21. A potentiometer wire has length 4m and resistance 8Ω. The resistance that must be connected in series with the wire and an accumulator of e.m.f 2V, so as to get a potential gradient 1mV per cm on the wire is : **[AIPMT-2015]**

(1) 40 Ω (2) 44 Ω (3) 48 Ω (4) 32 Ω

22. A, B and C are voltmeters of resistance R, 1.5R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively. Then : **[AIPMT-2015]**



(1) $V_A \neq V_B = V_C$ (2) $V_A = V_B \neq V_C$ (3) $V_A \neq V_B \neq V_C$ (4) $V_A = V_B = V_C$

23. A circuit contains an ammeter, a batter of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be: **[AIPMT-2015]**

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

24. Two metal wires of identical dimension are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is : **[AIPMT-2015]**

(1) $\frac{\sigma_1+\sigma_2}{2\sigma_1\sigma_2}$ (2) $\frac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$ (3) $\frac{\sigma_1\sigma_2}{\sigma_1+\sigma_2}$ (4) $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$

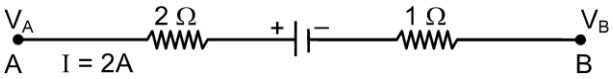
25. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f. E_0 and a resistance r_1. An unknown e.m.f. E is balanced at a length l of the potentiometer wire. The e.m.f. E will be given by : **[AIPMT-2015]**

(1) $\frac{E_0 r}{(r+r_1)}\cdot\frac{l}{L}$ (2) $\frac{E_0 l}{L}$ (3) $\frac{LE_0 r}{(r+r_1)l}$ (4) $\frac{LE_0 r}{lr_1}$

26. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive constants. The total heat produced in R is : **[AIPMT-2016]**

(1) $\frac{a^3R}{b}$ (2) $\frac{a^3R}{6b}$ (3) $\frac{a^3R}{3b}$ (4) $\frac{a^3R}{2b}$

27. The potential difference ($V_A - V_B$) between the points A and B in the given figure is **[NEET 2016]**



(1) + 9 V (2) – 3V (3) + 3 V (4) + 6 V

28. A filament bulb (500 W, 100 V) is to be used in a 230 V main suply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is : **[NEET 2016]**

(1) 13 Ω (2) 230 Ω (3) 46 Ω (4) 26 Ω

29. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be **[NEET-2017]**

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

30. A potentiometer is an accurate and versatile device to meke electrical measurements of E.M.F. because the method involves : **[NEET 2017]**

(1) cells (2) potential gradients

(3) a condition of no current flow through the galvanometer

(4) a combination of cells, galvanometer and resistance

31. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is :**[NEET 2018]**

(1) 40 Ω (2) 500 Ω (3) 250 Ω (4) 25 Ω

32. A carbon resistor of (47 $\pm$ 4.7) kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be **[NEET 2018]**

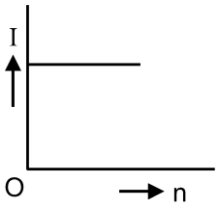
(1) Violet – Yellow – Orange – Silver (2) Green – Orange – Violet – Gold

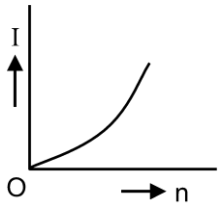
(3) Yellow – Green – Violet – Gold (4) Yellow – Violet – Orange – Silver

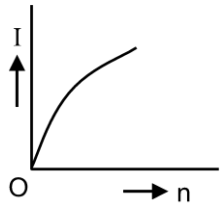
33. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is :- **[NEET 2018]**

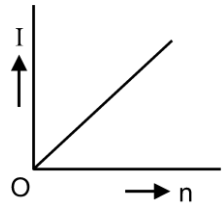
(1) 10 (2) 9 (3) 20 (4) 11

34. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n? **[NEET 2018]**

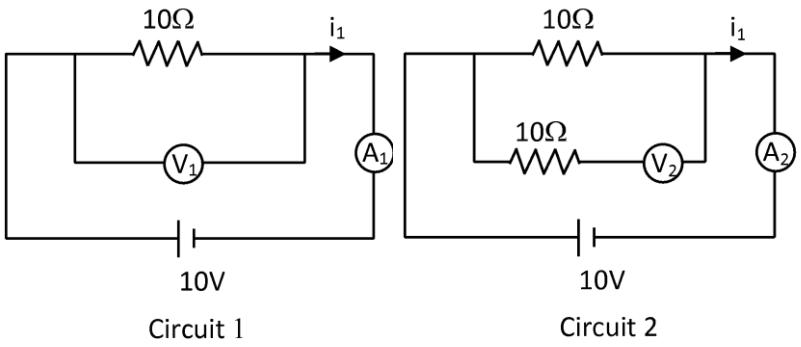
(1) 

(2) 

(3) 

(4) 

35. In the circuits shown below, the readings of the voltmeters and the ammeters will be: **[NEET_ 2019-I]**



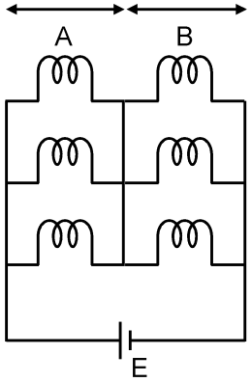
(1) $V_2 > V_1$ and $i_1 > i_2$ (2) $V_2 > V_1$ and $i_1 = i_2$ (3) $V_1 = V_2$ and $i_1 > i_2$ (4) $V_1 = V_2$ and $i_1 = i_2$

36. Which of the following acts as a circuit protection device? **[NEET_ 2019-I]**

(1) fuse (2) conductor (3) inductor (4) switch

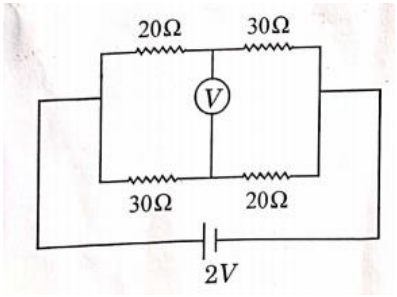
37. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.

The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be: **[NEET_2019-I]**



(1) 2 : 1 (1) 4 : 9 (3) 9 : 4 (4) 1 : 2

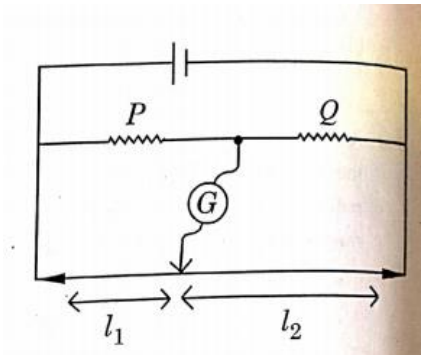
38. The reading of an ideal voltmeter in the circuit shown is **[NEET_2019 - II]**



(1) 0.6 V (2) 0 V (3) 0.5 V (4) 0.4 V

39. The metre bridge shown is in balance position with $\frac{P}{Q}=\frac{\square_1}{\square_2}$. If we now interchange the positions of galvanometer and cell, will the bridge work ? If yes, what will be balance condition?

[NEET_2019 - II]



(1) yes, $\frac{P}{Q}=\frac{\square_1-\square_1}{\square_2+\square_1}$ (2) no, no null point (3) yes, $\frac{P}{Q}=\frac{\square_2}{\square_1}$ (4) yes, $\frac{P}{Q}=\frac{\square_1}{\square_2}$

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

1. Two conductors have the same resistance at 0ºC 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, 8/144]

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

2. If a wire is stretched to make it 0.1% longer, its resistance will : **[AIEEE - 2011, 4/120, –1]**

(1) increase by 0.05% (2) increase by 0.2% (3) decrease by 0.2% (4) decrease by 0.05%

3. 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, 11 May; 4/120, –1]**

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

4. Two electric bulbs marked 25W – 220V and 100W – 220 V are connected in series to a 440 V supply. Which of the bulbs will fuse ? **[AIEEE 2012; 4/120, –1]**

(1) both (2) 100W (3) 25W (4) neither

5. 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; 4/120, –1]**

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

6. This questions has Statement I and Statement II. Of the four choices given after the Statements, choose the one that best describes the two Statements. **[JEE-Main 2013; 4/120, –1]**

Statement - I : For higher range, the resistance of ammeter ($R_A \approx$ shunt resistance) should be more.

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

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

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

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

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

7. The supply voltage to 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; 4/120, –1]**

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

8. In a large building, there are 15 bulbs of 40W, 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]**

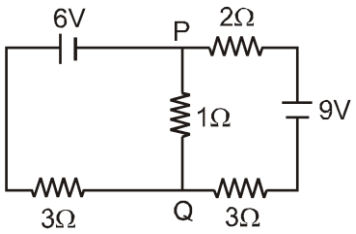
(1) 8 A (2) 10 A (3) 12 A (4) 14 A

9. 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(Main)-2015; 4/120, –1]

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

10. In the circuit shown, the current in the 1Ω resistor is : **[JEE(Main)-2015; 4/120, –1]**



(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

11. 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

12. The temperature dependence of resistances of Cu and undoped Si in the temperature range 300 – 400 K, is best described by : **[JEE(Main)-2016]**

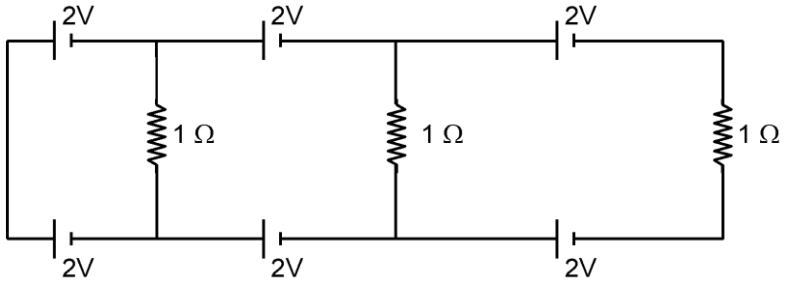
(1) Linear increase for Cu, exponential increase for Si

(2) Linear increase for Cu, exponential decrease for Si

(3) Linear decrease for Cu, linear decrease for Si

(4) Linear increase for Cu, linear increase for Si

13.



[JEE Main 2017]

In the above circuit the current in each resistance is :

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

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

(1) Krichhoff's second law represents energy conservation.

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

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

(4) A rheostat can be used as a potential divider.

15. When a current of 5mA is passed through a galvanometer having a coil of resistance 15Ω, it shows full scale defection. 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) $4.005 \times 10^3\ \Omega$ (2) $1.985 \times 10^3\ \Omega$ (3) $2.045 \times 10^3\ \Omega$ (4) $2.535 \times 10^3\ \Omega$

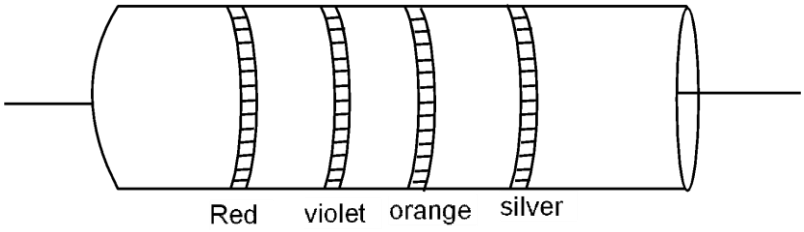
16. On interchanging the resistances, the balance point of a meter bridge shifts to the left by 10 cm. The resistance of their series combination is 1KΩ. How much was the resistance on the left slot before interchanging the resistances ? **[JEE-Main-2018]**

(1) 550 Ω (2) 910 Ω (3) 990 Ω (4) 505Ω

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

(1) 11.4V and 11.5 V (2) 11.7V and 11.8V (3) 11.6V and 11.7V (4) 11.5V and 11.6V

18. A resistance is shown in the figure. Its value and tolerance are given respectively by :**[JEE Main 2019]**



(1) 270Ω, 5% (2) 27 kΩ, 20% (3) 270 Ω, 10% (4) 27 kΩ, 10%

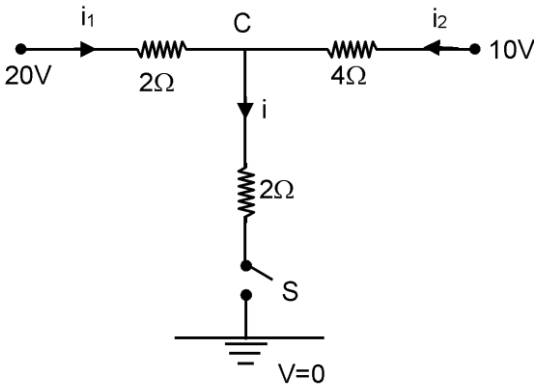
19. Drift speed of electrons, when 1.5A of current flows in a copper wire of cross section 5 mm^2, is v. If the electron density in copper is $9 \times 10^{28}\ /m^3$ the value of v in mm/s is close to (Take charge of electron to be $= 1.6 \times 10^{-19}$ C) **[JEE Main 2019]**

(1) 0.2 (2) 3 (3) 2 (4) 0.02

20. 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]**

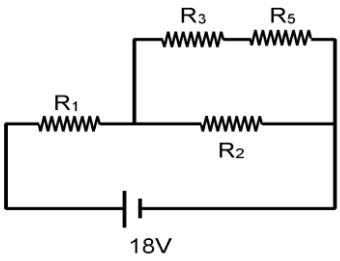
(1) 2.5% (2) 0.5% (3) 2.0% (4) 1.0%

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



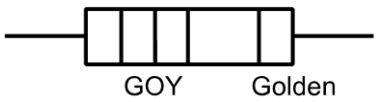
(1) 3A (2) 5A (3) 4A (4) 2A

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



(1) 450 Ω (2) 550 Ω (3) 230 Ω (4) 300 Ω

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

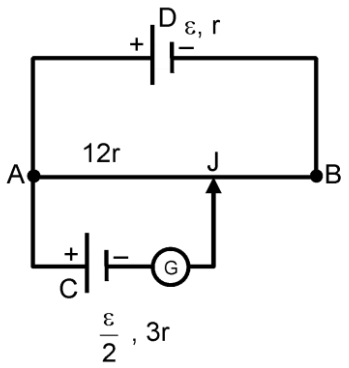


(1) 5.3 MΩ $\pm$ 5% (2) 530 kΩ $\pm$ 5%(3) 64 kΩ $\pm$ 10%(4) 6.4 MΩ $\pm$ 5%

24. A 2W 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]**

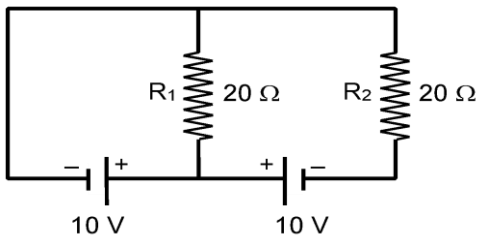
(1) 20mA (2) 63 mA (3) 0.4 mA (4) 100 mA

25. 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 ε/2 and internal resistance 3r is connected. The length AJ at which the galvanometer as shown in figure. shows no deflection is : **[JEE Main 2019]**



(1) $\frac{5}{12}L$ (2) $\frac{11}{24}L$ (3) $\frac{11}{12}L$ (4) $\frac{13}{24}L$

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]**

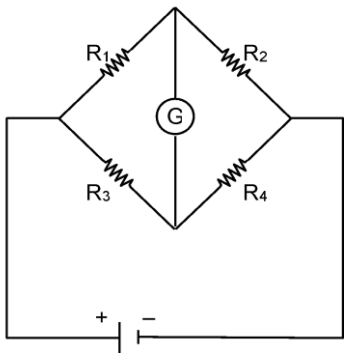


(1) 2, 2 (2) 0, 0 (3) 1, 2 (4) 0.5, 0

27. 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) 2 Ω (4) 8 Ω

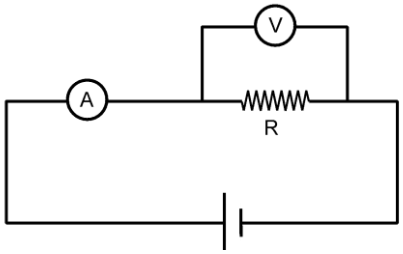
28. A current of 2 mA was passed through an unknown resistor which dissipated a power of 4.4 W. Dissipated power when an ideal power supply of 11V is connected across it is : **[JEE Main 2019]**
(1) 11×10^{-4} W (2) 11×10^{5} W (3) 11×10^{-3} W (4) 11×10^{-5} W

29. The Wheatstone bridge shown in figure 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 80Ω and 40Ω, 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]**



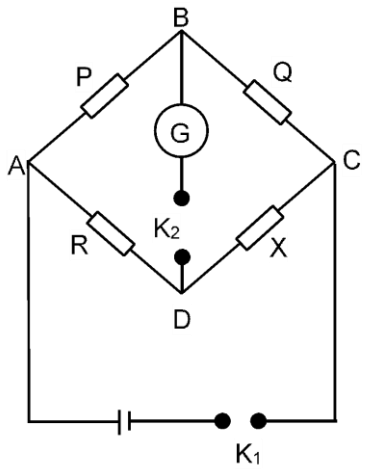
(1) Red, Green, Brown (2) Grey, Black, Brown (3) Brown, Blue, Brown (4) Brown, Blue, Black

30. The actual value of resitance R, shown in the figure is 30Ω. 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]**



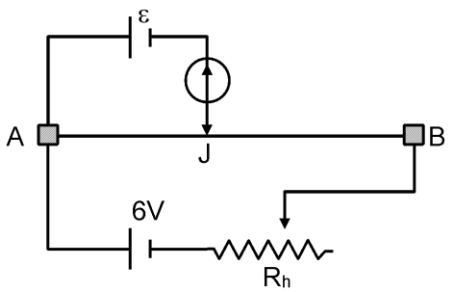
(1) 35Ω (2) 600Ω (3) 570Ω (4) 350Ω

31. 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) 402.5 ohm (3) 403.5 ohm (4) 401.5 ohm

32. The resistance of the meter bridge AB in given figure is 4Ω. With a cell of emf ε = 0.5 V and rheostat resistance R_h = 2Ω 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]**

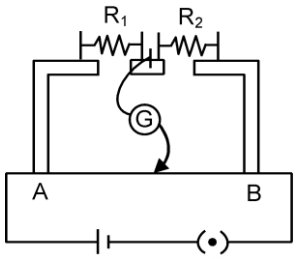


(1) 0.5 V (2) 0.3 V (3) 0.4 V (4) 0.6 V

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]**

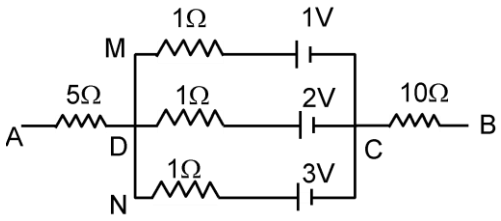
(1) 120 W (2) 60 W (3) 30 W (4) 240 W

34. In the experimental set up of meter bridge shown in the figure, the null point is obtained at a distance of 40 cm from A. If a 10Ω 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) 20 Ω (4) 40 Ω

35. In the circuit shown, the potential difference between A and B is **[JEE Main 2019]**



(1) 1 V (2) 3 V (3) 6 V (4) 2V

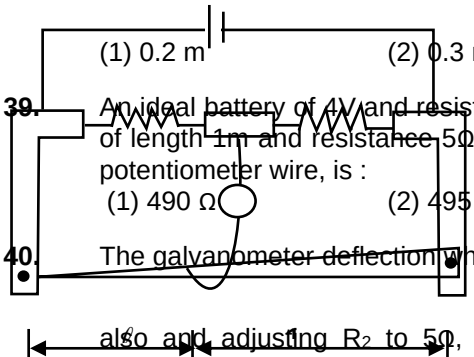
36. A galvanometer having a resistance of 20Ω and 30 divisions on both sides has figure of merit 0.005 ampere/division. The resistance that should be connected in series such that it can be used as a voltmeter upto 15 volt, is : **[JEE Main 2019]**

(1) 80Ω (2) 100Ω (3) 120Ω (4) 125Ω

37. 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 25W and 100 W bulbs draw powers P_1 and P_2 respectively, then: **[JEE Main 2019]**

(1) $P_1 = 4$ W, $P_2 = 16$W (2) $P_1 = 16$ W, $P_2 = 9$W
(3) $P_1 = 16$ W, $P_2 = 4$W (4) $P_1 = 9$ W, $P_2 = 16$W

38. In a meter bridge, the wire of length 1m has a non–uniform cross–section such that, the variation $\frac{dR}{d\ell}$ of its resistance R with length ℓ is $\frac{dR}{d\ell} \propto \frac{1}{\sqrt{\ell}}$. 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]**

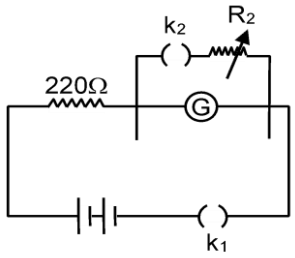


(1) 0.2 m (2) 0.3 m (3) 0.25 m (4) 0.35 m

39. An ideal battery of 4V and resistance R are connected in series 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 10 cm of potentiometer wire, is : **[JEE Main 2019]**

(1) 490 Ω (2) 495 Ω (3) 480 Ω (4) 395 Ω

40. The galvanometer deflection when key K_1 is closed but K_2 is open, equals θ_0 (see figure). On closing K_2 also and adjusting R_2 to 5Ω, 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]**

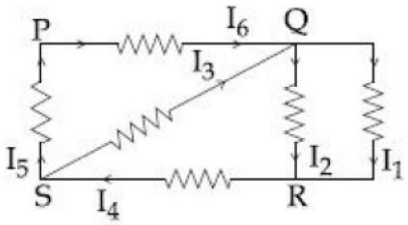


(1) 5 Ω (2) 12Ω (3) 25Ω (4) 22 Ω

41. 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) 250 ohm (2) 200 ohm (3) 6200 ohm (4) 6250 ohm

42. 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) –0.4 A, 0.4 A, 1.1 A (3) 0.4 A, 1.1 A, 0.4 A (4) 1.1 A, –0.4 A, 0.4 A

Answers

EXERCISE - 1

SECTION (A) :

1.	(3)	**2.**	(4)	**3.**	(1)

SECTION (B) :

1.	(4)	**2.**	(2)	**3.**	(3)	**4.**	(1)	**5.**	(4)	**6.**	(2)	**7.**	(3)
8.	(2)	**9.**	(4)	**10.**	(3)	**11.**	(2)	**12.**	(3)	**13.**	(2)	**14.**	(4)
15.	(4)	**16.**	(2)	**17.**	(2)	**18.**	(4)	**19.**	(1)	**20.**	(1)	**21.**	(3)
22.	(4)	**23.**	(2)	**24.**	(4)	**25.**	(2)	**26.**	(1)	**27.**	(1)	**28.**	(1)
29.	(3)	**30.**	(3)	**31.**	(3)	**32.**	(1)	**33.**	(4)	**34.**	(2)	**35.**	(3)
36.	(1)	**37.**	(2)	**38.**	(1)								

SECTION (C) :

1.	(2)	**2.**	(2)	**3.**	(2)	**4.**	(1)	**5.**	(4)	**6.**	(2)	**7.**	(4)
8.	(2)	**9.**	(4)	**10.**	(3)	**11.**	(1)	**12.**	(2)	**13.**	(3)	**14.**	(3)
15.	(2)	**16.**	(2)	**17.**	(2)	**18.**	(3)	**19.**	(3)	**20.**	(1)	**21.**	(1)
22.	(1)	**23.**	(3)	**24.**	(2)	**25.**	(4)	**26.**	(3)	**27.**	(4)	**28.**	(2)
29.	(4)												

SECTION (D) :

1.	**(a)**	(2)	**(b)**	(3)	**2.**	(2)	**3.**	(1)	**4.**	(3)	**5.**	(1)	
6.	(2)	**7.**	(1)	**8.**	(1)	**9.**	(1)	**10.**	**(3)**	**11.**	(3)	**12.**	(1)
13.	(4)	**14.**	(1)	**15.**	(1)	**16.**	(2)	**17.**	(2)	**18.**	(4)	**19.**	(1)
20.	(2)	**21.**	(1)	**22.**	(4)	**23.**	(3)	**24.**	(1)	**25.**	(1)	**26.**	(1)
27.	(1)	**28.**	(3)	**29.**	(3)	**30.**	(3)	**31.**	(1)	**32.**	(1)	**33.**	(2)
34.	(1)	**35.**	(4)	**36.**	(4)	**37.**	(1)	**38.**	(3)	**39.**	(4)	**40.**	(1)
41.	(2)	**42.**	(1)	**43.**	(4)	**44.**	(2)	**45.**	(3)	**46.**	(3)	**47.**	(1)
48.	(2)	**49.**	(4)	**50.**	(4)	**51.**	(1)	**52.**	(1)	**53.**	(1)	**54.**	(3)
55.	(2)	**56.**	(4)	**57.**	(4)	**58.**	(4)	**59.**	(3)	**60.**	(4)	**61.**	(4)

SECTION (E) :

1.	(3)	**2.**	(1)	**3.**	(3)	**4.**	(4)	**5.**	(4)	**6.**	(3)	**7.**	(3)
8.	(2)	**9.**	(2)	**10.**	(2)	**11.**	(1)						

SECTION (F) :

1.	(3)	**2.**	(1)	**3.**	(4)	**4.**	(3)	**5.**	(2)	**6.**	(2)	**7.**	(1)
8.	(3)	**9.**	(2)	**10.**	(2)	**11.**	(3)	**12.**	(2)	**13.**	(3)	**14.**	(2)
15.	(2)	**16.**	(1)	**17.**	(2)	**18.**	(1)	**19.**	(2)	**20.**	(3)	**21.**	(1)
22.	(3)	**23.**	(3)	**24.**	(1)	**25.**	(1)	**26.**	(3)	**27.**	(4)	**28.**	(2)
29.	(3)	**30.**	(2)	**31.**	(3)	**32.**	(3)	**33.**	(1)	**34.**	(1)	**35.**	(1)
36.	(4)	**37.**	(4)	**38.**	(1)	**39.**	(1)	**40.**	(4)	**41.**	(2)	**42.**	(2)
43.	(4)	**44.**	(1)										

EXERCISE - 2

PART – I

1.	(4)	**2.**	(4)	**3.**	(1)	**4.**	(1)	**5.**	(1)	**6.**	(4)	**7.**	(1)
8.	(2)	**9.**	(2)	**10.**	(3)	**11.**	(2)	**12.**	(3)	**13.**	(4)	**14.**	(2)
15.	(3)	**16.**	(1)	**17.**	(1)	**18.**	(2)	**19.**	(4)	**20.**	(2)	**21.**	(3)
22.	(4)	**23.**	(4)	**24.**	(1)	**25.**	(2)	**26.**	(4)	**27.**	(4)	**28.**	(1)
29.	(1)	**30.**	(1)	**31.**	(2)								

EXERCISE - 3

PART – I

1.	(4)	**2.**	(1)	**3.**	(2)	**4.**	(1)	**5.**	(4)	**6.**	(4)	**7.**	(1)
8.	(2)	**9.**	(3)	**10.**	(4)	**11.**	(3)	**12.**	(3)	**13.**	(3)	**14.**	(1)
15.	(1)	**16.**	(2)	**17.**	(2)	**18.**	(3)	**19.**	(3)	**20.**	(1)	**21.**	(4)
22.	(4)	**23.**	(4)	**24.**	(4)	**25.**	(1)	**26.**	(2)	**27.**	(1)	**28.**	(4)
29.	(3)	**30.**	(3)	**31.**	(3)	**32.**	(4)	**33.**	(1)	**34.**	(1)	**35.**	(4)
36.	(1)	**37.**	(3)	**38.**	(4)	**39.**	(4)						

PART – II

1.	(4)	**2.**	(2)	**3.**	(3)	**4.**	(3)	**5.**	(1)	**6.**	(4)	**7.**	(4)
8.	(3)	**9.**	(4)	**10.**	(3)	**11.**	(4)	**12.**	(2)	**13.**	(1)	**14.**	(3)
15.	(2)	**16.**	(1)	**17.**	(4)	**18.**	(4)	**19.**	(4)	**20.**	(4)	**21.**	(2)
22.	(4)	**23.**	(2)	**24.**	(1)	**25.**	(4)	**26.**	(4)	**27.**	(1)	**28.**	(4)
29.	(3)	**30.**	(3)	**31.**	(2)	**32.**	(2)	**33.**	(4)	**34.**	(1)	**35.**	(4)
36.	(1)	**37.**	(3)	**38.**	(3)	**39.**	(4)	**40.**	(4)	**41.**	(2)	**42.**	(1)