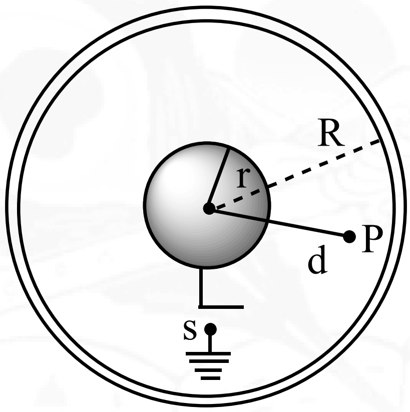
PHYSICS

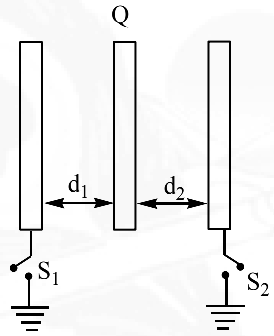
31. A Metallic sphere of radius r is kept inside a thin conducting shell of radius R such that their centres coincide. The system is initially uncharged and a charge Q is given to the conducting shell and the metallic sphere is connected to earth through a switch S as shown in figure.



After switch S is closed what is the magnitude of electric field intensity at a point 'P' whose distance is d from the concentric centre. (r < d < R)

1) zero 2) $\frac{1}{4\pi\epsilon_0}\frac{Qr}{(R+r)d^2}$ 3) $\frac{1}{4\pi\epsilon_0}\frac{Qr}{R.d^2}$ 4) $\frac{1}{4\pi\epsilon_0}\frac{Q}{R^2}$

32. Three identical metal plates of negligible thickness are arranged such that thickness of each plate is negligible when compared to the other dimension. The plates are parallel to each other and its front view is shown in figure. Outer plates are initially neutral and connected to earth with help of switches S_1, S_2 and charge given to the middle plate is Q. Separation distance between the left plate and middle plate is d_1 and the separation distance between middle plate and right plate is d_2.



When Both switches S_1, S_2 are closed. Then choose the correct statement

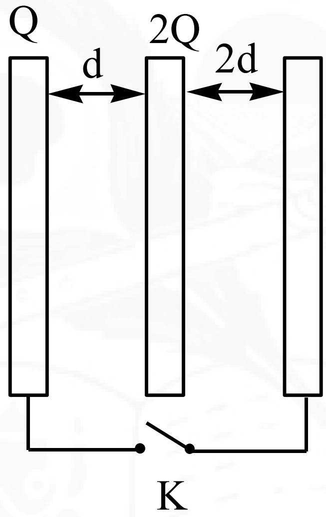
1) The magnitude of charge passing through switch 'S_1' is $\left(\frac{d_2}{d_1+d_2}\right)Q$

2) The magnitude of charge passing through switch S_2 is $\left(\frac{d_2}{d_1+d_2}\right)Q$.

3) The magnitude of charge passing through switch 'S_1' is $\frac{Q}{2}$

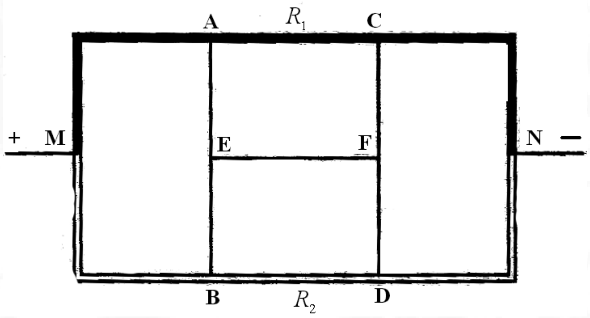
4) The magnitude of charge passing through switch S_2 is Q.

33. Three large metallic plates are arranged as shown. The amount of the charge that will flow through the switch K if it is closed is $\frac{nQ}{6}$ then the value of n. (Assume that the charges given to the left most plate and middle plate are Q, 2Q. But right plate is neutral.)



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

34. Two wires MACN and MBDN, of the same length but of different resistances R_1 and R_2 are connected as shown in the figure. Contacts A, B, C and D are arranged so that there is no current passing through wires AB and CD? Will current pass through AB and CD with this arrangement of contacts if two points E and F on these wires are connected?



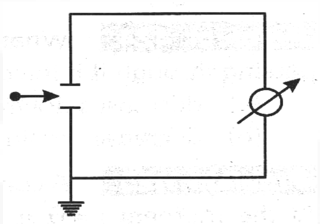
1) current will pass through AB, CD

2) current will not pass through AB, CD

3) current will pass through AB but not CD

4) current will pass through CD but not AB

35. The plates of a parallel plate capacitor are connected to a galvanometer. One of the plates is earthed. A positive charge is passed between the plates. What will be the reading of the Galvanometer ?



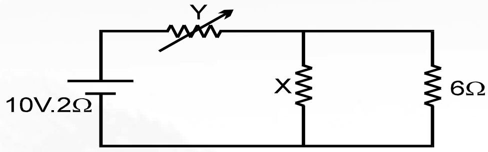
1) galvanometer shows no deflection

2) when the positive charge is entering into capacitor, galvanometer shows deflection; when the charge is leaving the capacitor, galvanometer shows deflection is opposite direction

3) during entering & leaving the capacitor deflection is the galvanometer is same direction

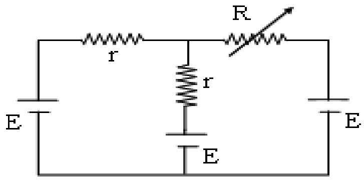
4) The needle of galvanometer oscillates many times when the charge is moving inside the capacitor

36. In the figure shown the thermal power generated in ' y ' is maximum when y = 4Ω. Then X is:



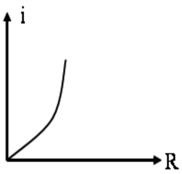
1) 2Ω 2) 3Ω 3) 1Ω 4) 6Ω

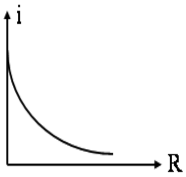
37. In the shown circuit the resistance R can be varied :

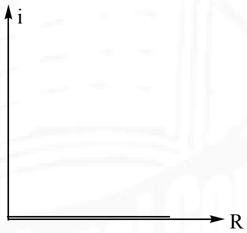


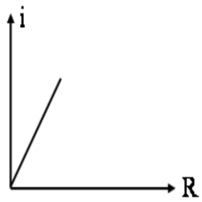
The variation of current through R against R is correctly plotted as :

(The best approximation graph is)

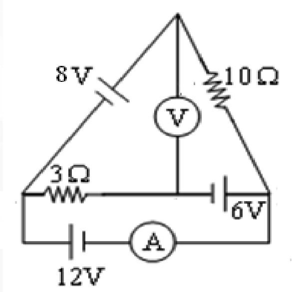
1) 

2) 

3) 

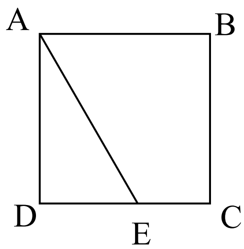
4) 

38. Find the reading of ammeter (A) and voltmeter (V) shown in figure assuming the instruments to be ideal.



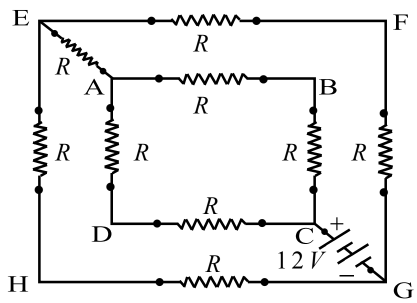
1) 8A, 26V 2) 26A, 16V 3) 3A, 12V 4) 8A, 32V

39. ABCD is square as shown in figure, where each side is a uniform wire of resistance 1Ω. A point E lies on CD such that a uniform wire of resistance 1Ω is connected across AE and constant potential difference is applied across A and C then B and E are equipotential. Ratio of resistance of CE to resistance of ED is $\sqrt{x}$. Find the value of x.



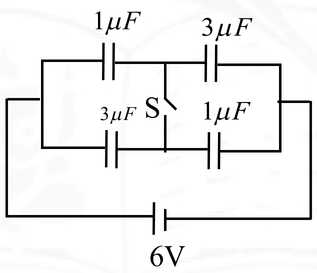
1) 2 2) ½ 3) 4 4) 3

40. In the given circuit the current provided by the source emf 12V and negligible in thermal resistance is x mA. Find value of x. $(R = 1K\Omega)$



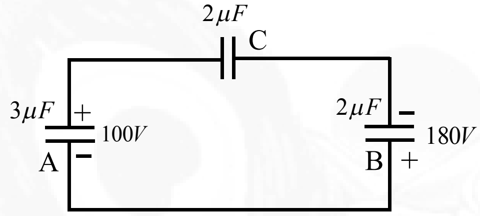
1) 2 2) 3 3) 4 4) 9

41. In the circuit when switch 'S' is closed the amount of charging passing the switch is $x\mu C$ then the value of x



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

42. Two capacitors A and B with capacitors 3μF and 2μF are charged to a potential difference of 100 V and 180 V respectively. The plates of the capacitors are connected as shown in fig. with one wire from each capacitor free. The upper plate of A is positive and that of B is negative. An uncharged 2μF capacitor C with lead wires falls on the free ends to complete the circuit. The final charge in μC on A,B and C are respectively :



1)360,300,0 2) 80,90,100 3) 270,210,90 4) 90,150,210

43. When a galvanometer is shunted with a 4Ω resistance, the deflection is reduced to one-fifth. If the galvanometer is further shunted with a 2Ω wire (2Ω and 4Ω resisters are connected in parallel), the further reduction in the deflection will be (the main current remains the same).

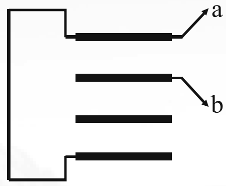
1) (8/13) of the deflection when shunted with 4Ω only

2) (5/13) of the deflection when shunted with 4Ω only

3) (3/4) of the deflection when shunted with 4Ω only

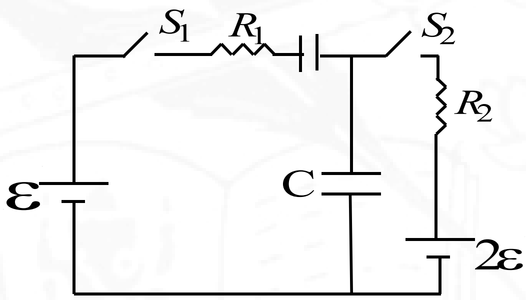
4) (3/13) of the deflection when shunted with 4Ω only

44. Four metallic plates each with a surface area of one side A are placed at a distance d from each other. The plates are connected as shown in the circuit diagram. Then the capacitance of the system between a and b is



1) $\frac{3\varepsilon_0 A}{d}$ 2) $\frac{2\varepsilon_0 A}{d}$ 3) $\frac{2\varepsilon_0 A}{3d}$ 4) $\frac{3\varepsilon_0 A}{2d}$

45. In the circuit shown, switch S_2 is closed first and is kept closed for a long time, now S_1 is closed. Just after that instant the current through S_1 is



1) $\frac{\varepsilon}{R_1}$ towards right 2) $\frac{\varepsilon}{R_1}$ towards left

3) zero 4) $\frac{2\varepsilon}{R_1}$

46. An uncharged capacitor is connected in series with a resistor and a battery. The charging of the capacitor starts at t=0. The rate at which energy in capacitor is stored :

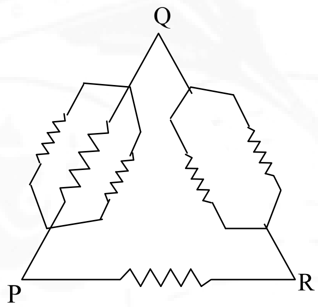
1) first increases reaches to maximum value then decreases

2) first decreases then increases

3) remains constant

4) continuously decreases

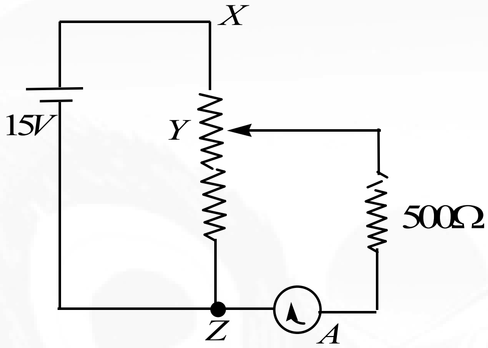
47. Six equal resistances are connected between points P, Q and R as shown. The net resistance of the system will be



1) Maximum between P and Q 2) Maximum between Q and R

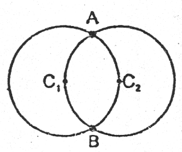
3) Maximum between P and R 4) Equal between any two points

48. A battery of 15V and of negligible internal resistance is connected to a rheostat XZ of 1kΩ. the resistance of YZ part is 500Ω. The reading or the ammeter will be



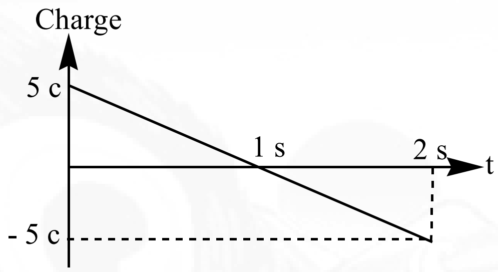
1) 1A 2) 0.1A 3) 0.01A 4) 0.001A

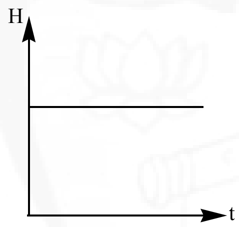
49. Two circular rings of identical radii and resistance of 36Ω each are placed in such a way that they cross each other's centre C_1 and C_2 as shown in figure. Conducting joints are made at intersection points A and B of the rings. An ideal cell of emf 20 volts is connected across AB. The power delivered by cell is

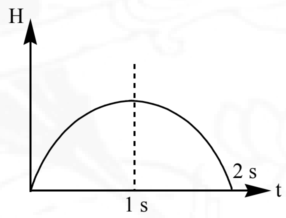


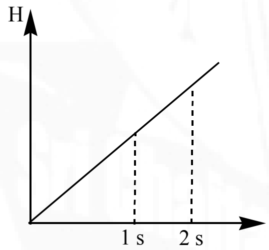
1) 80 watt 2) 100 watt 3) 120 watt 4) 200 watt

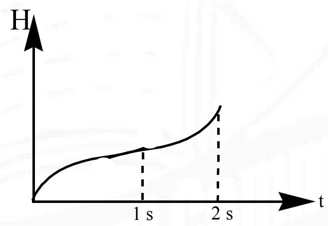
50. A charge passing through a resistor is varying with time as shown in the figure. The amount of heat generated in time ‘t’ is best represented (as a function of time) by :



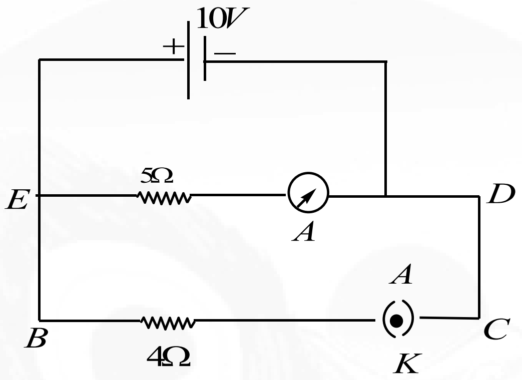
1) 

2) 

3) 

4) 

51. In the circuit shown, if key K is open, then ammeter reading will be ----------



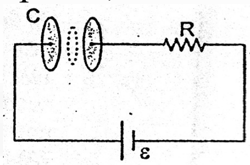
1)50A 2)2A 3)0.5A 4)$\frac{10}{9}A$

52. When a known resistance 10Ω and a conductor are connected in the right and left gaps of a meter bridge at 0^{o}C. The balancing length is found to be 50cm. If the temp of the conductor is increased to 100^{o}C; The balancing point is found to be at 52 cm. The temp coefficient of resistance of the material of the conductor is

1) $4.16\times10^{-3}/°C$ 2)$8.33\times10^{-4}/°C$

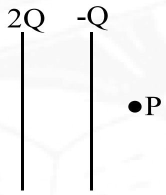
3)$8.33\times10^{-3}/°C$ 4)$4.16\times10^{-4}/°C$

53. In the circuit shown the capacitor of capacitance C is initially uncharged. Now the capacitor is connected in the circuit as shown. The charge passed through an imaginary circular loop parallel to the plates (also circular) and having the area equal to half of the area of the plates, in one time constant is :



1) $C\varepsilon\left(1-\frac{1}{e}\right)$ 2) $\frac{C\varepsilon}{2}\left(1-\frac{1}{e}\right)$ 3) $\frac{C\varepsilon}{4}$ 4) zero

54. In the figure shown the plates of a parallel plate capacitor have unequal charges. Its capacitance is 'C'. P is a point outside the capacitor and close to the plate of charge –Q. The distance between the plates is 'd', select incorrect alternative :



1) A point charge placed at point 'P' will experience electric force

2) The potential difference between the plates will be $\frac{3Q}{2C}$

3) The energy stored in the electric field in the region between the plates is $\frac{9Q^2}{8C}$

4) The force on one plate due to the other plate is $\frac{Q^2}{2\pi\varepsilon_0 d^2}$

55. A thick conducting slab is introduced between the plates of an isolated charged capacitor to fill the free space partially and without touching any plate. Which of the following is wrong statement regarding the points inside the capacitor

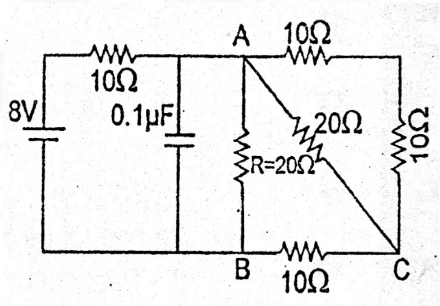
1) Electric field at some points will change and at some points remains unchanged

2) Electric field is zero at all the points

3) Electrostatic energy density at some points will change and that at some points remains unchanged

4) Total electrostatic energy of the capacitor will decrease

56. A capacitor of capacitance $0.1\mu F$ is connected to a battery of emf 8V as shown in the fig. Under steady state condition



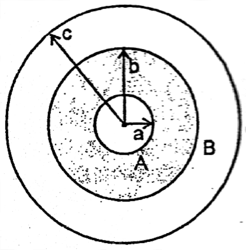
1) Charge on the capacitor is $0.4\mu C$ 2) Charge on the capacitor is $0.2\mu C$

3) Current in the resistor (R) between points A & B is 0.1 A

4) Current in the resistor (R) between points A & B is 0.4 A

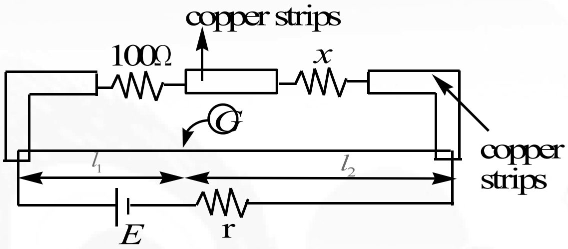
57. Two identical capacitors are charged to different potentials, then they are connected to each other in such a way that the sum of charges on plates having positive polarity remains constant. Mark the correct statement.
1) Sum of charges of plates having negative polarity remains constant
2) Mean of individual final potentials is different from mean of individual initial potentials
3) Total energy stored in two capacitors in final state may be equal to that in initial state.
4) Heat dissipation in the circuit could be zero

58. In the figure shown A and C are concentric conducting spherical shells of radius a and c respectively. A is surrounded by a concentric dielectric medium of inner radius a, outer radius b and dielectric constant k. If sphere A is given a charge Q, the potential at the outer surface of the dielectric is



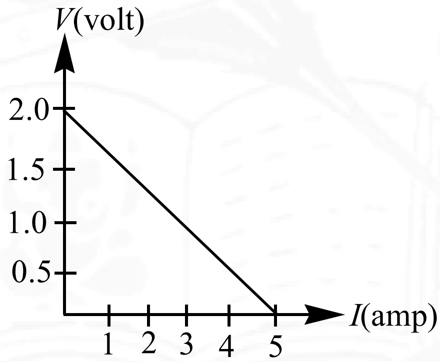
1) $\frac{Q}{4\pi\varepsilon_0 kb}$ 2) $\frac{Q}{4\pi\varepsilon_0}\left(\frac{1}{a}+\frac{1}{k(b-a)}\right)$ 3) $\frac{Q}{4\pi\varepsilon_0 b}$ 4) $\frac{Q}{4\pi\varepsilon_0 a}$

59. In a practical wheat stone bridge circuit as shown, when one more resistance of 100Ω is connected is parallel with unknown resistance 'x', then ratio ℓ_1/ℓ_2 become '2'. ℓ_1 is balance length. AB is a uniform wire. Then value of 'x' must be



1) 50Ω 2) 100Ω 3) 200Ω 4) 400Ω

60. For a cell, a graph is plotted between the potential difference V across the terminals of the cell and the current I drawn from the cell. The e.m.f and the internal resistance of the cell are E and r, respectively. Then



1) $E = 2V, r = 0.5\Omega$ 2) $E = 2V, r = 0.4\Omega$ 3) $E > 2V, r = 0.5\Omega$ 4) $E > 2V, r = 0.4\Omega$