PHYSICS

BOOKS - DC PANDEY ENGLISH

ELECTROSTATICS

Jee Main

1. Figure represents a square carrying charges $+q,\ +q,\ -q,\ -q$ at its four corners as shown. Then the potential will be zero at points

A. A, B, C, P and Q

B. A, B and C

C. A, P, C and Q

D. P, B and Q

Answer: B

Watch Video Solution

2. A particle of charges Q and mass m travels through a potential difference V from rest. The final momentum of the particle is

A. $\frac{mv}{Q}$

B. $2Q\sqrt{mV}$

C. $\sqrt{2mQV}$

D. $\sqrt{\frac{2QV}{m}}$

Answer: C

Watch Video Solution

3. Three concentric conducting spherical shells carry charges as : $+4Q$ on the inner shell, $-2Q$ on the middle shell and $-5Q$ on the outer shell. The

charge on the inner surface of the outer shell is

A. 0

B. $4Q$

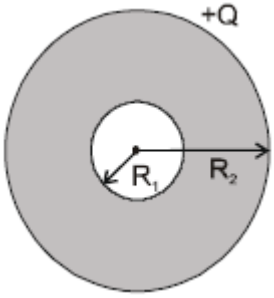
C. $-Q$

D. $-2Q$

Answer: D

Watch Video Solution

4. Figure shows thick metallic sphere. If it is given a charge $+Q$, then electric field will be present in the region



(A)$r < R_1$ only (B)$r > R_2$ only (C)$r < R_1$ and $r > R_2$ (D)$R_1 < r < R_2$

A. $r < R_1$ only

B. $r > R_2$ only

C. $r < R_1$ and $r > R_2$

D. $R_1 < r < R_2$

Answer: C

Watch Video Solution

5. The work done against electric in increasing the potential difference of a condenser from 20 V to 40 V is W. The work done in increasing its potential difference from 40 V to 50 V will be

A. 4W

B. $\frac{3W}{4}$

C. 2W

D. $\frac{W}{2}$

Answer: C

Watch Video Solution

6. The plate separation in a parallel plate condenser and plate area is A. If it is charged to V volt battery is diconnected then the work done increasing the plate separation to 2d will be

A. $\frac{3}{2}\frac{\varepsilon_0 A V^2}{d}$

B. $\frac{\varepsilon_0 A V^2}{d}$

C. $\frac{2\varepsilon_0 A V^2}{d}$

D. $\frac{\varepsilon_0 A V^2}{2d}$

Answer: D

Watch Video Solution

7. The effective capacity with the following figure between the points P and Q will closest to

A. $3\mu F$

B. $5\mu F$

C. $2\mu F$

D. $1\mu F$

Answer: D

Watch Video Solution

8. A parallel plate condenser is connected to a battery of e.m.f. 4 volt. If a plate of dielectric constant inserted into it, then the potential difference on condenser will be

A. 0.5 V

B. 2 V

C. 4V

D. 32 V

Answer: C

Watch Video Solution

9. In the above problem, if the battery is disconnected before inserting the dielectric, then difference will be

A. 0.5 V

B. 2 V

C. 4 V

D. 32 V

Answer: A

Watch Video Solution

10. Two parallel plate condensers of capacity $20mF$ and $30mF$ are charged to the potentials of 30 V and 20 V respectively. If likely charged plates are connected together then the common potential difference be

A. 100 V

B. 50 V

C. 24 V

D. 10 V

Answer: C

Watch Video Solution

11. The minimum number of condensers each capacitance of $2\mu F$, in order to obtain result capacitance of $5\mu F$ will be

A. 4

B. 5

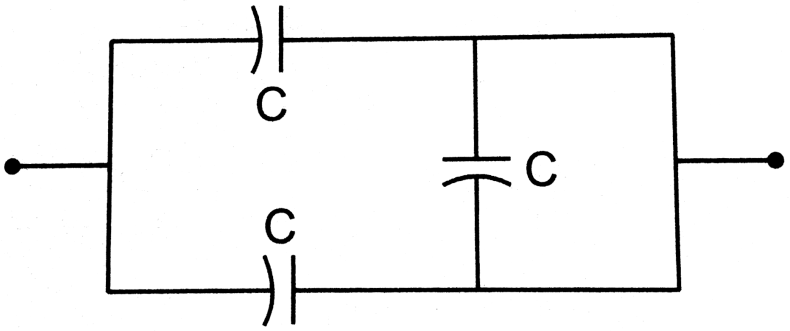
C. 6

D. 3

Answer: A

Watch Video Solution

12. The equivalent capacitance of the combination show in figure is



A. C

B. 2C

C. $\frac{3}{2}C$

D. $\frac{C}{2}$

Answer: B

Watch Video Solution

13. The total energy stored in the condenser system shown in the figure will be

A. $2 \times 10^{-6} J$

B. $4 \times 10^{-6} J$

C. $8 \times 10^{-6} J$

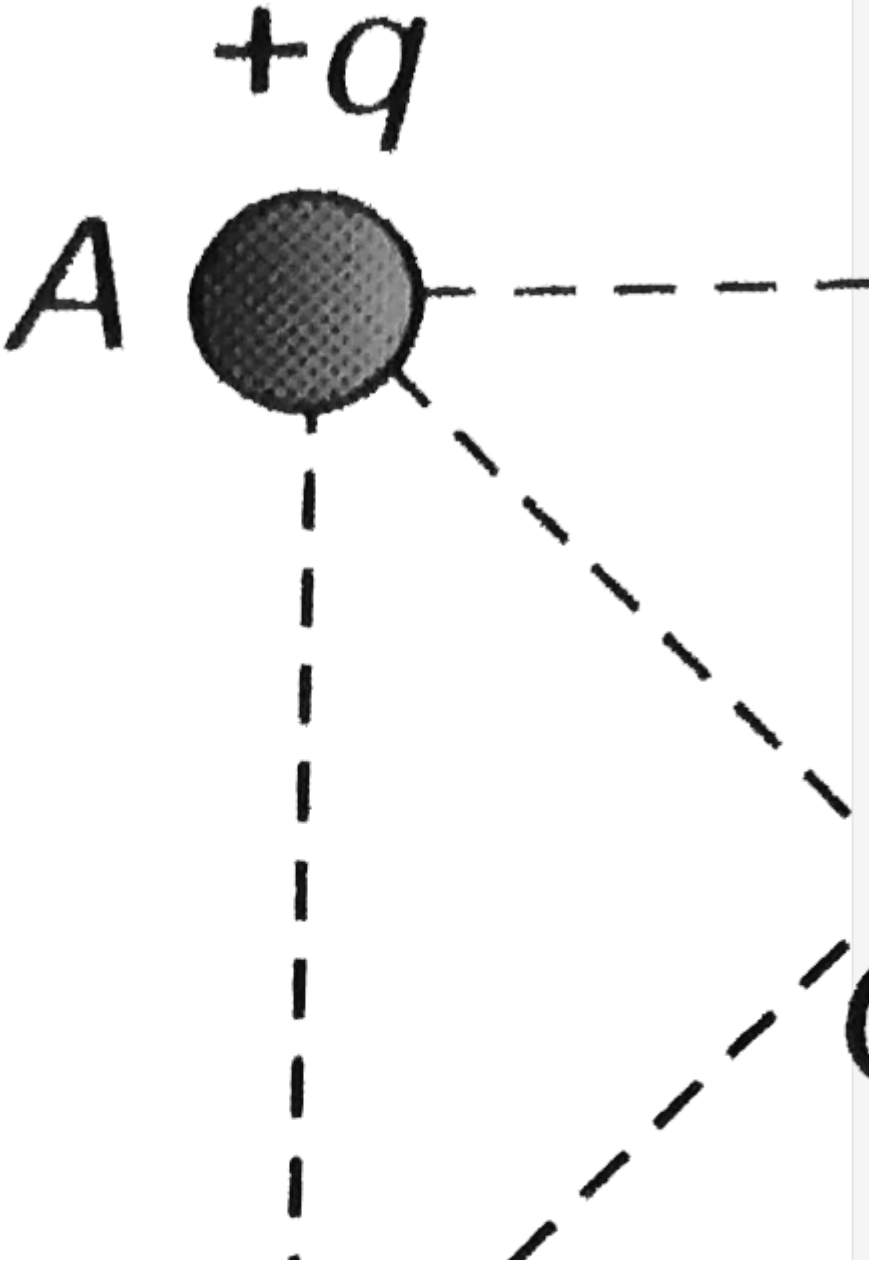
D. $16 \times 10^{-6} J$

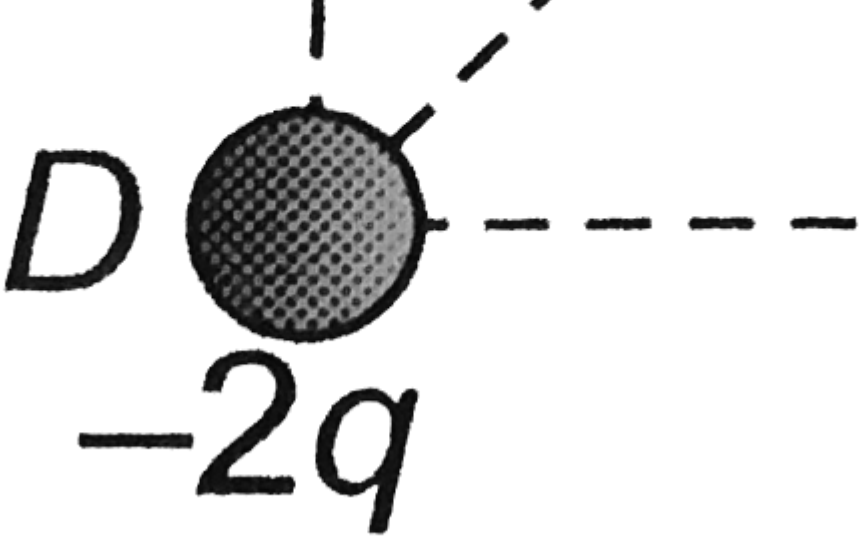
Answer: C

Watch Video Solution

14. Four charges are arranged at the corners of a square ABCD, as shown.

The force on a positive charge kept at the centre of the square is





(A)zero (B)along diagonal AC

(C)along diagonal BD (D)perpendicular to the side AB

A. zero

B. along diagonal AC

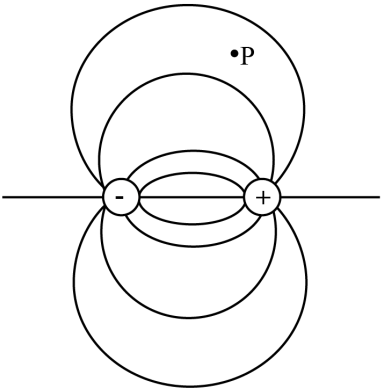
C. along diagonal BD

D. perpendicular to the side AB

Answer: A

Watch Video Solution

15. Figure shows the electric field lines around an electric dipole. Which of the arrows best represents the electric field at point P ?



A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

16. Point P lies on the axis of a dipole . If the dipole is rotated by 90° anti-clock wise , the electric field vector $\vec{E}$ at P will rotate by .

A. 90° clockwise

B. 180° clockwise

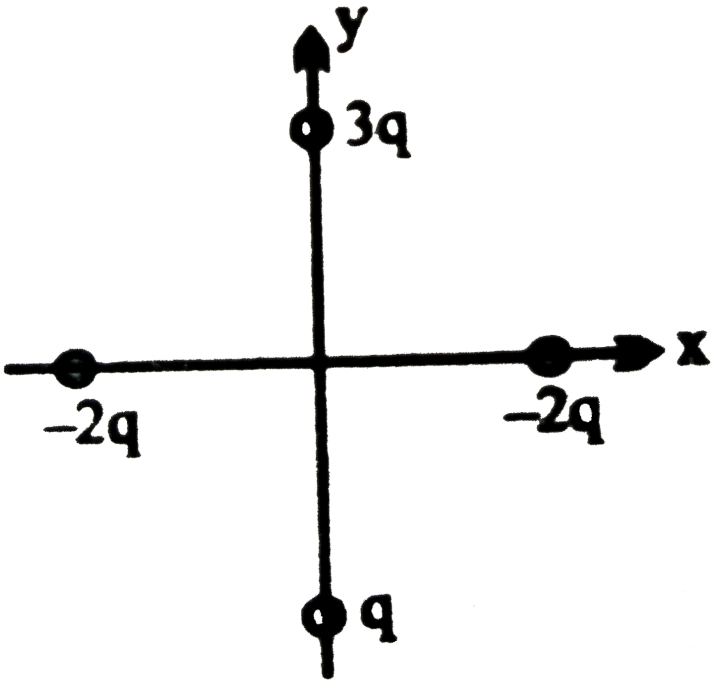
C. 90° anticlockwise

D. 180° anticlockwise

Answer: A

Watch Video Solution

17. 4 charges are placed each at a distance a from origin . The dipole moment of configuration is .



A. $2qa\hat{j}$

B. $3qa\hat{j}$

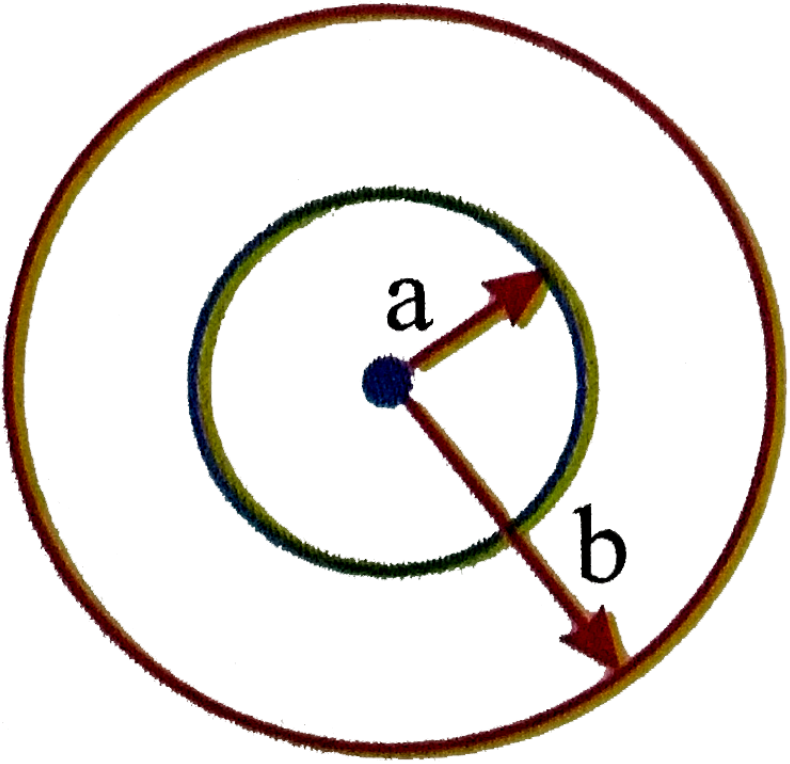
C. $2aq\left(\hat{i}+\hat{j}\right)$

D. $2aq\left(\hat{i}-\hat{j}\right)$

Answer: A

Watch Video Solution

18. If the electric potential of the inner metal sphere is 10 volt & that of the outer shell is 5 volt then the potential at the centre will be



A. 10 V

B. 5 V

C. 15 V

D. 0

Answer: A

Watch Video Solution

19. A solid sphere of radius R has charge q uniformly distributed over its volume. The distance from it surfce at which the electrostatic potential is equal to half of the potential at the centre is

A. R

B. R/2

C. R/3

D. 2R

Answer: C

Watch Video Solution

20. A particle of charge $1\mu C\&$ mass $1g$ moving with a velocity of $4m/s$ is subjected to a uniform electric field of magnitude $300Vm$ for $10\,\text{sec}$. Then it's final speed cannot be :

A. 0.5 m/s

B. 4 m/s

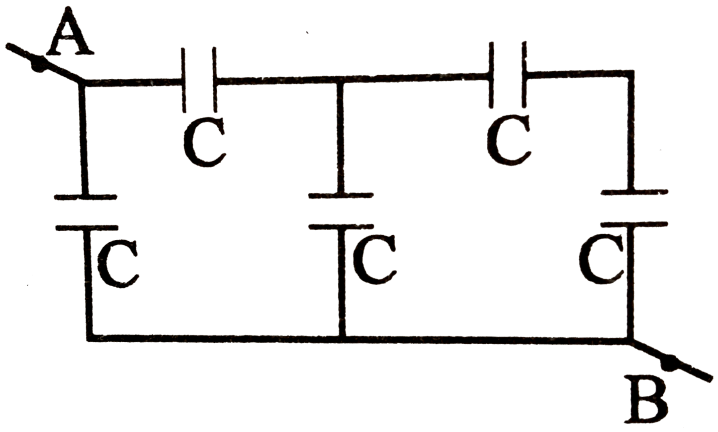
C. 3 m/s

D. 6 m/s

Answer: A

Watch Video Solution

21. What is the equivalent capacitance of the system of capacitors between $A\&B$



A. $\frac{7}{6}C$

B. 1.6 C

C. C

D. None of these

Answer: B

Watch Video Solution

22. Three capacitors $2\mu F, 3\mu F$ and $5\mu F$ can withstand voltages to $3V$,$2V$ and $1V$ respectively. Their series combination can withstand a maximum

voltage equal to

A. 5 V

B. 31/6 V

C. 26/5 V

D. 6 V

Answer: B

Watch Video Solution

23. Two charged particles are placed at a distance 1.0 cm apart. What is the minimum possible magnitude of the electric force acting o each charge?

A. $2.3 \times 10^{-24} N$

B. $6.2 \times 10^{-34} N$

C. $1.02 \times 10^{-26} N$

D. $4.2 \times 10^{-27} N$

Answer: A

Watch Video Solution

24. Electric field on the axis of a small electric dipole at a distance r is $\vec{E}_1$ and $\vec{E}_2$ at a distance of $2r$ on a line of perpendicular bisector is

A. $E_2 = -E_1/8$

B. $E_2 = -E_1/16$

C. $E_2 = -E_1/4$

D. $E_2 = E_1/8$

Answer: B

Watch Video Solution

25. The point charges $-2q, \ -2q$ and $+q$ are put on the vertices of an equilateral triangle of side a. Find the work done by some external force in increasing the separation to $2a$ (in joules).

A. $\frac{1}{4\pi\varepsilon_0}.\frac{2q^2}{a}$

B. negativee

C. zero

D. $\frac{1}{4\pi\varepsilon_0}.\frac{3q^2}{a}$

Answer: C

Watch Video Solution

26. A point charge q is placed inside a conducting spherical shell of inner radius 2R and outer radius 3R at a distance of R fro the centre of the shell. The electric potential at the centre of shell will (potential at infinity is zero).

A. $\frac{q}{2R}$

B. $\frac{4q}{3R}$

C. $\frac{5q}{6R}$

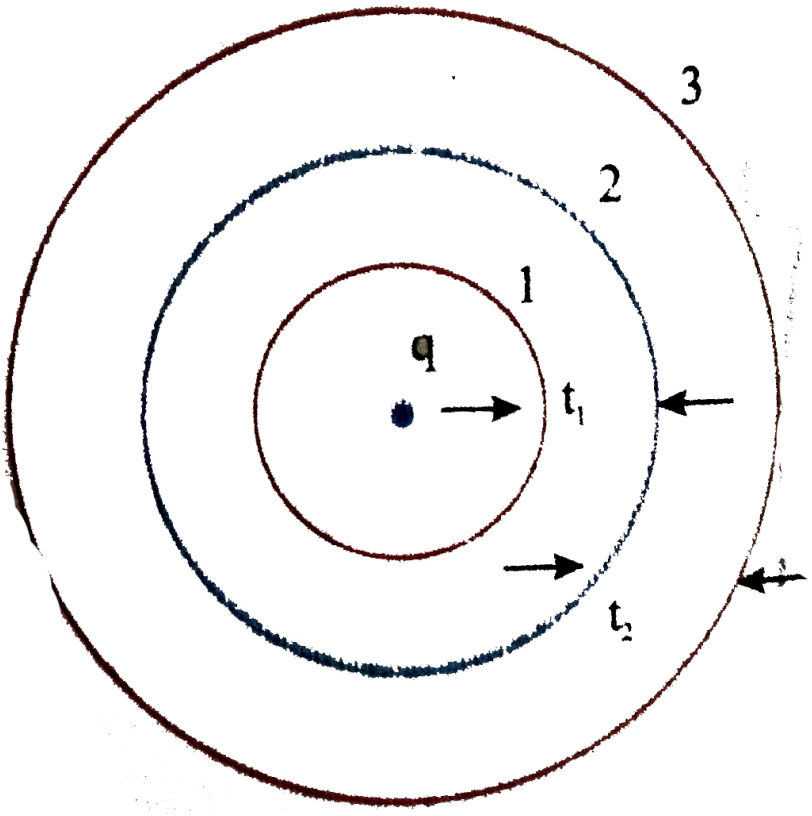
D. $\frac{2q}{3R}$

Answer: C

Watch Video Solution

27. Figures shows three spherical and equipotential surfaces $1, 2$ and 3 round a point charge q.The potential difference $v_1 - v_2 = V_2 - V_3$ if t_1

and t_2 be the distance between them ,then



A. $t_1 = t_2$

B. $t_1 > t_2$

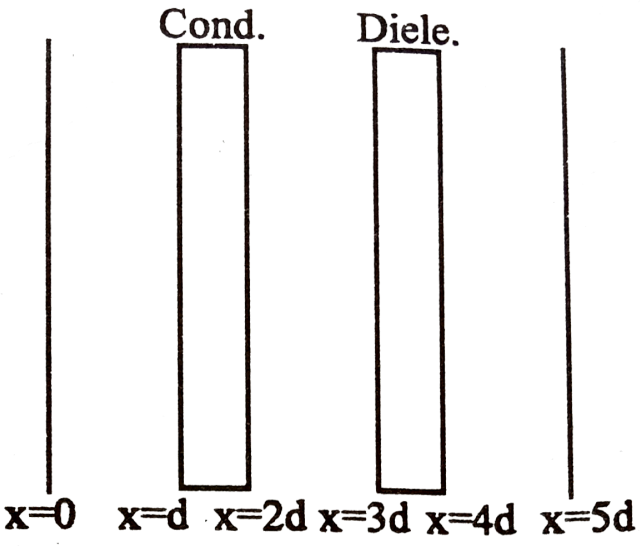
C. $t_1 < t_2$

D. $t_1 \leq t_2$

Answer: C

Watch Video Solution

28. The distance between plates of a parallel plate capacitor is $5d$. Let the positively charged plate is at $x = 0$ and negatively charged plate is at $x = 5d$. Two slabs one fo conductor and other of a dielectric of equal thickness d are inserted between the plates as shown in figure. Potential verus distance graph will look like:



A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

29. A point charge q is placed at a distance of r from cebtre of an uncharged conducting sphere of rad $R(<r)$. The potential at any point on the sphere is

A. a. zero

B. b. $\frac{1}{4\pi\varepsilon_0}\frac{q}{r}$

C. c. $\frac{1}{4\pi\varepsilon_0}\frac{qR}{r^2}$

D. d. $\frac{1}{4\pi\varepsilon_0}\frac{qr^2}{R}$

Answer: B

Watch Video Solution

30. An electric field is given by $\vec{E} = \left(y\hat{i} + x\hat{j}\right)\frac{N}{C}$. Find the work done (in J) in moving a $1C$ charge from $\vec{r}_A = \left(2\hat{i} + 2\hat{j}\right)$ m to $\vec{r}_B = \left(4\hat{i} + \hat{j}\right)m$.

A. $+4J$

B. $-4J$

C. $+8J$

D. zero

Answer: D

Watch Video Solution

31. Capacity of a spherical capacitor is C_1 when inner sphere is charged and outer sphere is earthed and C_2 when inner sphere is earthed and outer sphere charged. Then $\frac{C_1}{C_2}$ is (a = radius of inner sphere b = radius of outer sphere)

A. 1

B. $\frac{a}{b}$

C. $\frac{b}{a}$

D. $\frac{a+b}{a-b}$

Answer: B

Watch Video Solution

32. The capacitance of a capacitor becomes$4/3$ times its original value if a dielectric slab of thickness $t = d/2$ is inserted between the plates (d is the separation between the plates). What is the dielectric constant of the slab?

A. 2

B. 4

C. 6

D. 8

Answer: A

Watch Video Solution

33. The plates of a parallel plate capacitor are charged up to $100v$. Now, after removing the battery, a $2mm$ thick plate is inserted between the plates Then, to maintain the same potential deffernce, the distance betweem the capacitor plates is increase by $1.6mm$. The dielectric canstant of the plate is .

A. 6

B. 8

C. 5

D. 4

Answer: C

Watch Video Solution

34. A capacitor is connected to a battery. The force of attraction between the plates when the separation between them is halved.

A. remains the same

B. becomes eight times

C. becomes four times

D. becomes two times

Answer: C

Watch Video Solution

35. A number of spherical conductors of different radius have same potential. Then the surface charge density on them.

A. is proportional to their radii

B. is inversely proportional to their radii

C. are equal

D. is proportional to square of their radii

Answer: B

Watch Video Solution

36. Three charged particles are initially in position 1, "They are free to move and they come in position" 2 "after some time. Let" U_1 and U_2 be the electrostatic potential energies in position 1 and 2. Then

A. $(a) U_1 > U_2$

B. $(b) U_2 > U_1$

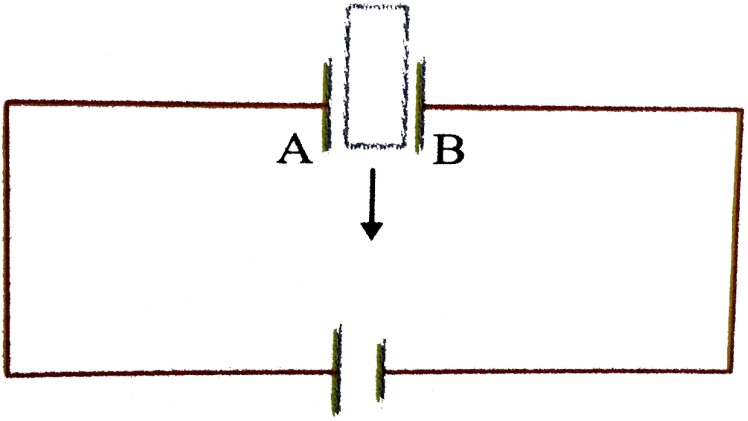
C. $(c) U_1 = U_2$

D. $(d) U_2 \geq U_1$

Answer: A

Watch Video Solution

37. An insulator plate is passed between the plates of a capacitor. Then current



A. always flows from A to B

B. always flows from B to A

C. first flows from A to B and then from B to A

D. first flows from B to A and then from A to B

Answer: D

Watch Video Solution

38. Two point charges 2q and 8q are placed at a distance r apart. Where should a third charge $-q$ be placed between them so that the electrical potential energy of the system is a minimum

A. at a distance of r/3 from 2q

B. at a distance of 2r/3 from 2q

C. at a distance of r/16 from 2q

D. None of the above

Answer: A

Watch Video Solution

39. A capacitor of capacitance $10\mu F$ is charged to a potential $50V$ with a battery. The battery is now disconnected and an additional charge $200\mu C$ is given to the positive plate of the capacitor. The potential difference across the capacitor will be.

A. 50 V

B. 80 V

C. 100 V

D. 60 V

Answer: D

Watch Video Solution

40. A parallel plate capacitor has two layers of dielectrics as shown in figure. This capacitor is connected across a battery, then the ratio of potential difference across the dielectric layers is

A. $4/3$

B. $1/2$

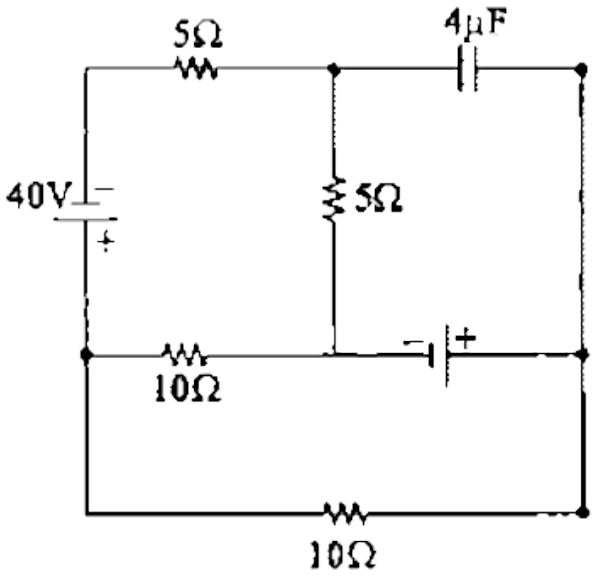
C. $1/3$

D. $3/2$

Answer: D

Watch Video Solution

41. In the circuit shown in figure 3.141, find the energy stored in $4\mu F$ capacitor in steady state.



A. $20\mu C$

B. $40\mu C$

C. $10\mu C$

D. $120\mu C$

Answer: A

Watch Video Solution

42. In the given arrangement of the capacitors, one $3\mu F$ capacitor has got $600\mu J$ of energy. Then the potential difference across $2\mu F$ capacitor is

A. 40 V

B. 15 V

C. 60 V

D. 45 V

Answer: D

Watch Video Solution

43. An alpha particle of energy $5MeV$ is scattered through 180° by a found uramiam nucleus . The distance of closest approach is of the order of

A. 1 Å

B. 10^{-10} cm

C. 10^{-12} cm

D. 10^{-15} cm

Answer: C

Watch Video Solution

44. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is $10V$. The potential at the distance $3cm$ from the centre of the sphere is:

A. zero

B. 10 V

C. same as at a point 5 cm away from the surface

D. same as at a point 25 cm away from the surface

Answer: B

Watch Video Solution

45. Two equal negative charges $-q$ are fixed at points $(0, -a)$ and $(0, a)$ on y-axis. A poistive charge Q is released from rest at point $(2a, 0)$ on the x-axis. The charge Q will

A. (a)execute simple harmonic motion about the origin move to the origin and remain at rest

B. (b)move to infinity

C. (c)execute oscillatory but not simple of the harmonic motion

D. (d) None of these

Answer: D

Watch Video Solution

46. A charge q is placed at the centre of the line joining two equal charges Q. The system of the three charges will be in equilibrium if q is equal to:

A. $-\frac{Q}{2}$

B. $-\frac{Q}{4}$

C. $+\frac{Q}{4}$

D. $+\frac{Q}{2}$

Answer: B

Watch Video Solution

47. A charge q is placed at the centre of the cubical vessel (with one face a open) as shown in figure. The flux of the electric field through the complete vessel is

A. $q/6\varepsilon_0$

B. q/ε_0

C. $5q/6\varepsilon_0$

D. $q/4\varepsilon_0$

Answer: C

Watch Video Solution

48. A parallel plate capacitor is charged and then isolated. On increasing the plate separation

A.	Charge remains constant	Potential Difference remains constant	Capacitance decreases

B. Charge remains constant | Potential Difference increases | Capacitance decreases

C. Charge remains constant | Potential Difference decreases | Capacitance increases

D. Charge increases | Potential Difference decreases | Capacitance increases

Answer: B

Watch Video Solution

49. On placing dielectric slab between the plates of an isolated charged condenser its

A.

Capcitance decreases | Potential Difference decreases | Energy stored increases | Electric F increase

B.

Capcitance increases | Potential Difference increases | Energy stored increases | Electric F decreas

C.

Capcitance increases | Potential Difference decreases | Energy stored decreases | Electric F decreas

D.

Capcitance	Potential Difference	Energy stored	Electric F
decreases	decreases	increases	remain

Answer: C

Watch Video Solution

50. The time constant of charging of the capacitor charging of the capacitor shown in figure is

A. $\frac{2}{3}RC$

B. $2RC$

C. $3RC$

D. $\frac{3}{2}RC$

Answer: B

Watch Video Solution

51. Time constant of a C-R circuit is $\frac{2}{\ln(2)}$ second. Capacitor is discharged at time $t = 0$. The ratio of charge on the capacitor at time $t = 2s$ and $t = 6s$ is

A. $3:1$

B. $8:1$

C. $4:1$

D. $2:1$

Answer: C

Watch Video Solution

52. In the circuit shown in figure $C_1 = 2C_2$. Capacitance C_1 is charged to a potential of V. The current in the circuit just after the switch S is closed is

A. zero

B. $\frac{2V}{R}$

C. infinite

D. $\frac{V}{2R}$

Answer: D

Watch Video Solution

53. A $4\mu F$ capacitor, a resistance of $2.5M\Omega$ is in series with $12V$ battery. Find the time after which the potential difference across the capacitor is 3 times the potential difference across the resistor. [Given In (2) = 0.693]

A. 13.86 s

B. 6.93 s

C. 7 s

D. 14 s

Answer: A

Watch Video Solution

54. A certain charge Q is divided into two parts q and $Q - q$, wheich are then separated by a cetain distance. What must q be in terms of Q to maximum the electrostatic repulsion between the two charges?

A. $(Q/q) = (4/1)$

B. $(Q/q) = (2/1)$

C. $(Q/q) = (3/4)$

D. $(Q/q) = (5/1)$

Answer: B

Watch Video Solution

55. Two particles (free to move) with charges $+q$ and $+4q$ are a distance L apart. A third charge is placed so that the entire system is in equilibrium.

(a) Find the location, magnitude and sign of the third charge.

(b) Show that the equilibrium is unstable.

A. $Q = \frac{4}{9}q(\text{negative})\text{at}\frac{l}{3}$

B. $Q = \frac{4}{9}q(\text{positive})\ \text{at}\frac{l}{3}$

C. $Q = q(\text{positive})\ \text{at}\frac{l}{3}$

D. $Q = q(\text{negative})\ \text{at}\frac{l}{3}$

Answer: A

Watch Video Solution

56. Four equal positive charge are fixed at the vertical of a square of side L. Z-axis is perpendicular to plane of the square. The point $Z = 0$ is the point where the diagonals of the square intersect each other. The plot of electic field due to the charges, as one moves on the Z-axis is

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

57. Four equal charges of magnitudes q each are placed at four corners of a square with its centre at origin and lying in y-z plane. Aa fifth charge $+Q$ is moved along x-axis. The electrostatic potential energy (U) varies on x-axis as

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

58. Two small conductors A and B are given charges q_1 and q_2 respectively. Now they are placed inside a hollow metallic conductor C carrying a charge Q. If all the three conductors A, B and C are connected by a conducting wire as shown, the charges on A,B and C will be respectively :

A. $\frac{q_1+q_2}{2}, \frac{q_1+q_2}{2}, Q$

B. $\frac{Q+q_1+q_2}{3}, \frac{Q+q_1+q_2}{3}, \frac{Q+q_1+q_2}{3}$

C. $\frac{q_1+q_2+Q}{2}, \frac{q_1+q_2+Q}{3}, 0$

D. $0, 0, Q+q_1+q_2$

Answer: D

Watch Video Solution

59. Find power produced in 5Ω resistance in steady state after closing the switch S :

A. 10 W

B. 20 W

C. 30 W

D. zero

Answer: D

Watch Video Solution

60. Two particles are held in equilibrium by the gravitational and electrostatic forces between them. Particle-A has mass m_α and charge q_α and particle-B has mass m_b and charge q_b. The distance between the charges may cause the chages to accelerate towards one another ?

A. m_a is doubled and m_b is halved

B. m_a is doubled and m_b is doubled

C. q_a is doubled and q_b is doubled

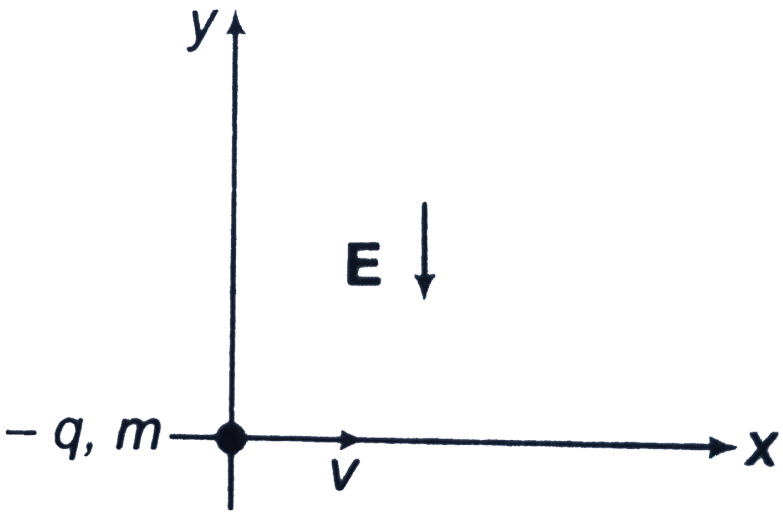
D. d is doubled

Answer: B

Watch Video Solution

61. A particle of mass m and charge $-q$ is projected from the origin with a horizontal speed v into an electric field of intensity E directed downward.

Choose the wrong statement. Neglect gravity



A. The kinetic energy after a vertical displacement y is qEy

B. The horizontal and vertical components of acceleration are

$$a_x = 0, a_y = \frac{qE}{m}$$

C. The equation of trajectory is $y = \frac{1}{2}\left(\frac{qEx^2}{mv^2}\right)$

D. The position at time t x = vt and $y = \frac{1}{2}a_y t^2$

Answer: A

Watch Video Solution

62. A proton a deutron and an α particle are accelerated through potentials of V, $2V$ and $4V$ respectively. Their velocity will bear a ratio

A. $1:1:1$

B. $1:\sqrt{2}:1$

C. $\sqrt{2}:1:1$

D. $1:1:\sqrt{2}$

Answer: D

Watch Video Solution

63. Four charges of $6\mu C, 2\mu C, -12\mu C$ and $4\mu C$ are placed at the corners of a square of side 1m. The square is in x-y plane and its centre is at origin. Electric potential due to these charges is zero everywhere or the line

A. $x = y, z = 0$

B. $z = 0 = z$

C. $x = 0 = y$

D. $x = z, y = 0$

Answer: C

Watch Video Solution

64. Four point charges $+q,\ +q,\ -q$ and $-q$ are placed on the corners of a square of side length 'a' as shown in the figure. The magnitude of electric field at a point which is at a distance $x(>>a)$ from the centre along a line perpendicular to the plane of the square and passing through the centre is

A. $\frac{\sqrt{2}qa}{4\pi\varepsilon x^2}$

B. $\frac{qa}{2\pi\varepsilon_0 x^3}$

C. $\frac{\sqrt{2}qa}{2\pi\varepsilon_0 x^3}$

D. $\frac{qa}{4\pi\varepsilon_0 x^3}$

Answer: B

Watch Video Solution

65. Two identical small conducting spheres having unequal positive charges q_1 and q_2 are separated by a distance r. If they are now made to touch each other and then separated again to the same distance, the electrostatic force between them in this case will be

A. less than before

B. same as before

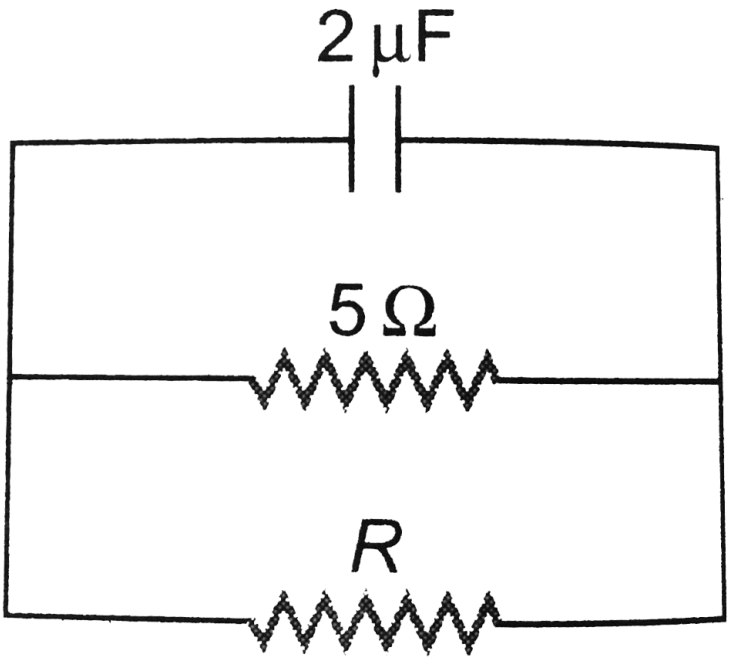
C. more than before

D. can't predict

Answer: C

Watch Video Solution

66. A capacitor of capacitance $2\mu F$ is charged to a potential difference of $5V$. Now, the charging battery is disconected and the capacitor is connected in parallel to a resistor of 5Ω and another unknown resistor of resistance R as shown in figure. If the total heat produced in 5Ω resistance is $10\mu J$ then the unknown resistance R is equal to



A. 10Ω

B. 15Ω

C. $(10/3)\Omega$

D. 7.5Ω

Answer: C

Watch Video Solution

67. In the figure, two point charges $+q$ and $-q$ are placed on the x-axis at $(+a, 0)$ and $(-a, 0)$ respectively. A tiny dipole of dipolem moment (p) is kept at the origin along the y-axis. The torque on the dipole equals

A. zero

B. $\frac{qp}{2\pi\varepsilon_0 a^2}$

C. $\frac{qp}{4\pi\varepsilon_0 a^2}$

D. $\frac{qp}{\pi\varepsilon_0 a^2}$

Answer: B

Watch Video Solution

68. Four point charges are kept on y-axis at $(0, a), (0, 2a), (0, -a)$ and $(0, -2a)$ as shown in the figure. Which of the following graphs, best represents the variation of electrostatic potential V as a function of distance x from the origin, on the x-axis.

A. 

B. 

C. 

D. None of these

Answer: D

Watch Video Solution

69. An electron goes from one equi-potential surface another along one of the four paths shown in diagram. Rank the paths according to the

work by the electrostatic force from the least to greatest.

A. 1,2,3,4

B. 4,3,2,1

C. 1,3 (4 and 2 equal)

D. (4 and 2 equal),3,1

Answer: D

Watch Video Solution

70. Three large conducting plates carrying charges $Q, 2Q$ and $3Q$ on them, are placed parallel to each other as shown in the figure. If U_1 and U_2 denote electrostatic potential energy in the space between 1^{st} and 2^{nd} plane and 2^{nd} and 3^{rd} plate respectively as indicated, then $\frac{U_2}{U_1}$ equals

A. 1

B. 0

C. $2/3$

D. $3/2$

Answer: B

Watch Video Solution

71. A metal sphere of radius 'a' is having charge $+Q$. Now it is connected by a conducting wire concentric spherical shell of radius '2a'. Then the potential at the surface of outer shell is

Here, $K = \frac{1}{4\pi\varepsilon_0}$

A. $\frac{KQ}{a}$

B. $\frac{KQ}{2a}$

C. $\frac{3}{2}\frac{KQ}{a}$

D. $\frac{2KQ}{a}$

Answer: B

Watch Video Solution

Jee Advanced

1. The potential field of an electric field $\vec{E} = \left(y\hat{i} + x\hat{j}\right)$ is

A. $V = -xy +$ constant

B. $V = -(x + y) +$ constant

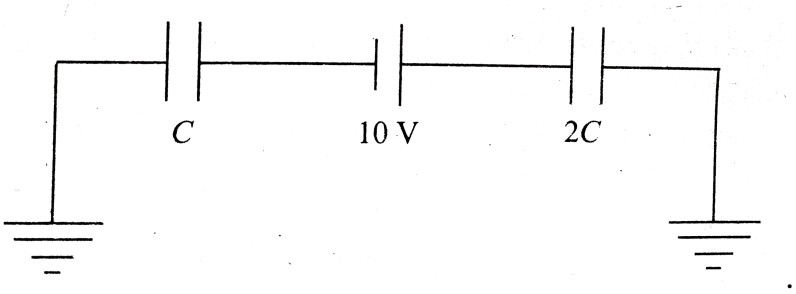
C. $V = -\left(x^2 + y^2\right) +$ constant

D. V = constant

Answer: A

Watch Video Solution

2. In the ciruit shown in, $C = 6\mu F$. The charge stored in the capacitor of capacity C is`



A. zero

B. $90\mu C$

C. $40\mu C$

D. $60\mu C$

Answer: C

Watch Video Solution

3. A capacitor of capacity $C_1 = 1\mu F$ is charged to a potential of 100 V. The charging battery is then removed and it is connected to another

capacitor of capacity $C_2 = 2\mu F$. One plate of C_2 is earthed as shown in figure. The charges on C_1 and C_2 in steady state will be

A. $50\mu C, 50\mu C$

B. $100\mu C, zero$

C. $\frac{100}{3}\mu C, \frac{200}{3}\mu C$

D. zero,zer

Answer: B

Watch Video Solution

4. Assuming an expression for the potential of an isolated conductor, show that the capacitance of such a sphere will be increased by a factor n, if it is enclosed within an earthed concentric sphere, the ration of the spheres being $\frac{n}{n-1}$.

A. $\frac{n^2}{n-1}$

B. $\frac{n}{n-1}$

C. $\frac{2n}{n+1}$

D. $\frac{2n+1}{n+1}$

Answer: B

Watch Video Solution

5. Three conducting spheres A, B and C are shown in figure. The radii of the spheres are a, b and c respectively. A and B connected by a conducting wire. The capacity of the system is

A. $4\pi\varepsilon_0(a+b+c)$

B. $4\pi\varepsilon_0\left(\frac{bc}{c-b}\right)$

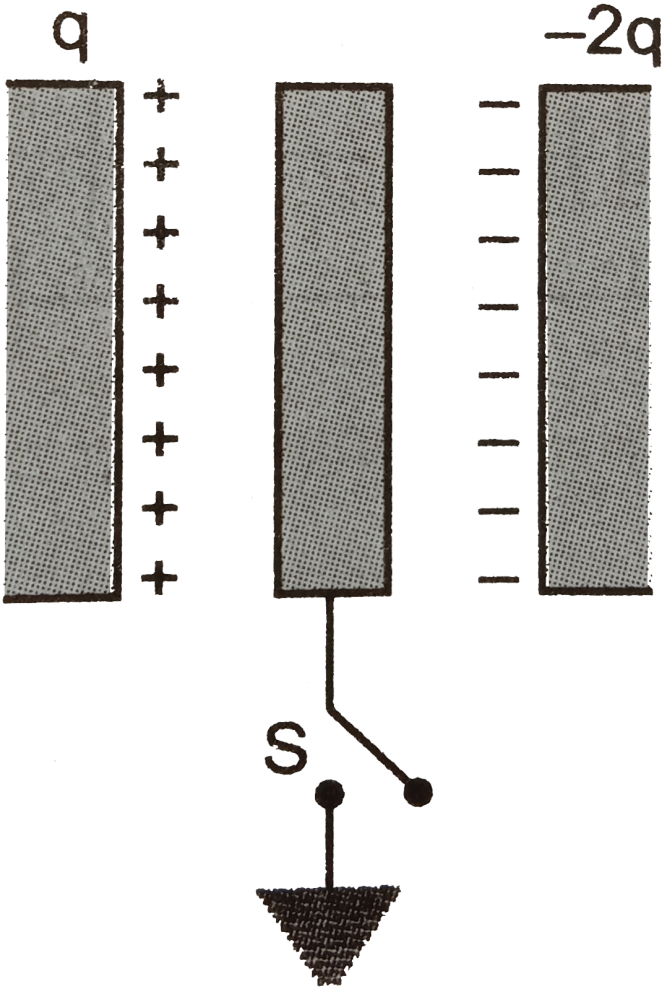
C. $4\pi\varepsilon_0\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

D. $4\pi\varepsilon_0\left(\frac{abc}{ab+bc+ca}\right)$

Answer: B

Watch Video Solution

6. The metal plate on the left in Fig, carries a charge $+q$. The metal plate on the right has a charge of $-2q$. What charge will flow through S when it is closed if the central plate is initially neutral ?



A. zero

B. $-q$

C. $+q$

D. $+2q$

Answer: C

Watch Video Solution

7. A particle of mass an charge q is projected vertically upwards .A uniform electric field $\vec{E}$ is acted vertically downwards.The most appropriate graph between potential energy U (gravitation plus electrostatic) and height h($<<$ radius of earth) is :(assume U to be zero on surface of earth)

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

8. A conducting sphere of radius R is charged to a potential of V volts. Then the electric field at a distance $r(>R)$ from the centre of the sphere would be

A. $\frac{V}{r}$

B. $\frac{R^2V}{r^3}$

C. $\frac{RV}{r^2}$

D. $\frac{rV}{R^2}$

Answer: C

Watch Video Solution

9. A spherical charged conductor has surface charge density σ.The intensity of electric field and potential on its surface are E and V .Now radius of sphere is halved keeping the charge density as constant .The new electric field on the surface and potential at the centre of the sphere are

A. 2E, 2 V

B. E, V/2

C. 4E, 4 V

D. 2E, 4 V

Answer: B

Watch Video Solution

10. A spherical charged conductor has surface charge density σ.The intensity of electric field and potential on its surface are E and V, now

radius is halved keeping surface charge density to be constant. Then the new values will be

A. $E, \frac{V}{2}$

B. $W, 2V$

C. $2E, V$

D. $\frac{E}{2}, V$

Answer: A

Watch Video Solution

11. Two concentric spherical conducting shells of radii R and 2R are carrying charges q and 2q, respectively. Both are now connected by a conducting wire. Find the change in electric potential (inV) on the outer shell.

A. zero

B. $\frac{3kQ}{2R}$

C. $\frac{kQ}{R}$

D. $\frac{2kQ}{R}$

Answer: A

Watch Video Solution

12. A conducting shell of radius R carries charge $-Q$. A point charge $+Q$ is placed at the centre. The electric field E varies with distance r (from the centre of the shell) as

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

13. The gap between the plates of a parallel plate capacitor is filled with glass of resistivity ρ. The capacitance of the capacitor without glass equals C. The leakage current of the capacitor when a voltage V is applied to it is

A. $\frac{V\rho}{C\varepsilon_0}$

B. $\frac{CV}{\rho\varepsilon_0}$

C. $\frac{V\varepsilon_0}{C\rho}$

D. $\frac{CV\rho}{\varepsilon_0}$

Answer: B

Watch Video Solution

14. If the capacitance of each capacitor is C, then effective capacitance of the shown network across any two junction is

A. 2C

B. C

C. $\frac{C}{2}$

D. 5C

Answer: A

Watch Video Solution

15. Two identical positive charges are fixed on the y-axis, at equal distances from the origin O. A particle with a negative charges starts on the x-axis at a large distance from O. moves along the x-axis passes through O, and moves far away from O on the other side. Its acceleration a is taken as positive along its direction of motion. Plot acceleration a of the particle against its x-coordinate.

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

16. Two ideantical point charges are placed at a separation of d. P is a point on the line joining the charges, at a distance x from any one charge. The field at P is E, E is plotted against x for value of x from close to zero to slightly less then d. Which of the following represents the resulting curve

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

17. An air capacitor consists of two parallel plates B as shown in the figure. Plate A is given a change and plate B is given a charge 3Q. P is the median plane of the capacitor. If C_0 is the capacitor capacitor, then

A. $V_P - V_A = \frac{Q}{4C_0}$

B. $V_P - V_A = \frac{Q}{2C_0}$

C. $V_P - V_A = -\frac{Q}{C_0}$

D. $V_P - V_B = -\frac{Q}{4C_0}$

Answer: B

Watch Video Solution

18. A hollow sphere of radius 2R is charged to V volts and another smaller sphere of radius R is charged to V/2 volts. Now the smaller sphere is

placed inside the bigger sphere without changing the net charge on each sphere. The potential difference between the two spheres would be

A. $\frac{3V}{2}$

B. $\frac{V}{4}$

C. $\frac{V}{2}$

D. V

Answer: B

Watch Video Solution

19. A point charge q is placed at a distance of r from the centre O of an uncharged spherical shell of inner radius R and outer radius 2R. The electric potential at the centre of the shell will be

A. $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r}-\frac{1}{2R}\right)$

B. $\frac{q}{4\pi\varepsilon_0 r}$

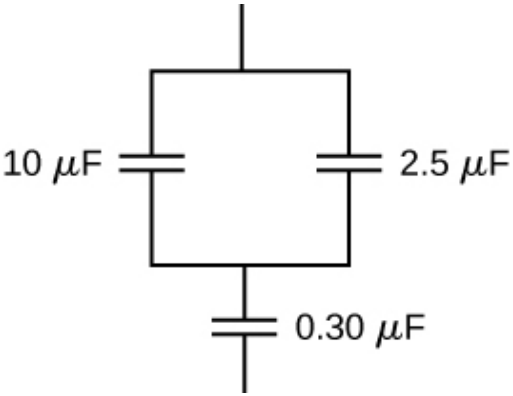
C. $\frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r}+\frac{1}{2R}\right)$

D. None of these

Answer: A

Watch Video Solution

20. Find the equivalent capacitance between A and B



A. $5\mu F$

B. $4\mu F$

C. $3\mu F$

D. $2\mu F$

Answer: A

Watch Video Solution

21. A small electric dipole is placed at origin with its dipole moment directed along positive x-axis .The direction of electric field at point $\left(2, 2\sqrt{2}, 0\right)$

A. along z-aixs

B. along y-axis

C. along negative y-axis

D. along negative z-axis

Answer: B

Watch Video Solution

22. Four equal charges of magnitudes q each are placed at four corners of a square with its centre at origin and lying in y-z plane. Aa fifth charge $+Q$ is moved along x-axis. The electrostatic potential energy (U) varies on x-axis as

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

23. A solid conducting sphere of radius $10cm$ is enclosed by a thin metallic shell of radius $20cm$. A charge $q = 20\mu C$ is given to the inner sphere is connected to the shell by a conducting wire.

A. 12 J

B. 9 J

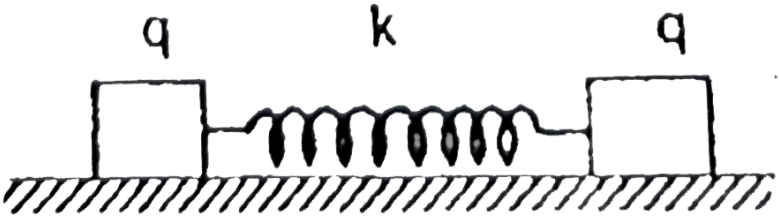
C. 24 J

D. zero

Answer: B

Watch Video Solution

24. Two identical particles of charge q each are connected by a massless spring of force constant k. They are placed over a smooth horizontal surface. They are released when the separation between them is r and spring is unstretched. If maximum extension of the spring is r, the value of k is (neglect gravitational effect)



A. $\frac{q}{4r}\sqrt{\frac{1}{\pi\varepsilon_0 r}}$

B. $\frac{q}{2r}\sqrt{\frac{1}{\pi\varepsilon_0 r}}$

C. $\frac{2q}{r}\sqrt{\frac{1}{\pi\varepsilon_0 r}}$

D. None of these

Answer: D

Watch Video Solution

25. A capacitor is filled with an insulator and a certain potential difference is applied to its pltaes. The energy stored in the capacitor is U. Now the capacitor is disconnected from the source and the insulator is pulled out of the capacitor. The work performed against the forces of electric field in pulling out the insulator is $4U$. Then dielectric constant of the insulator is.

A. 4

B. 8

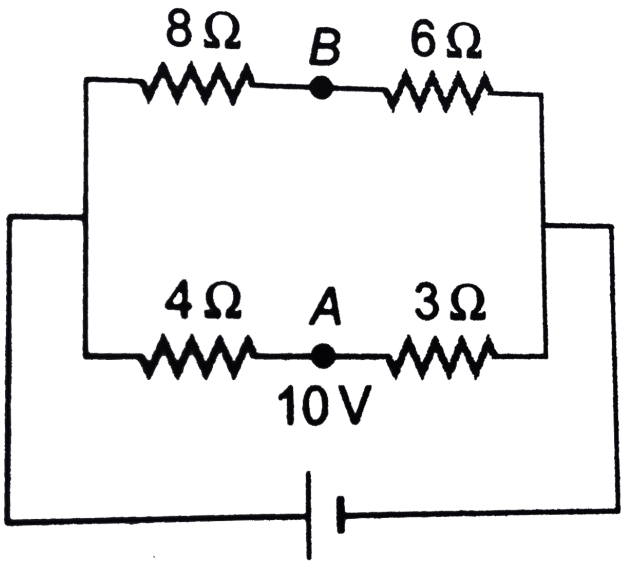
C. 5

D. 3

Answer: C

Watch Video Solution

26. The potential difference between points A and B is



A. 30 V

B. 60 V

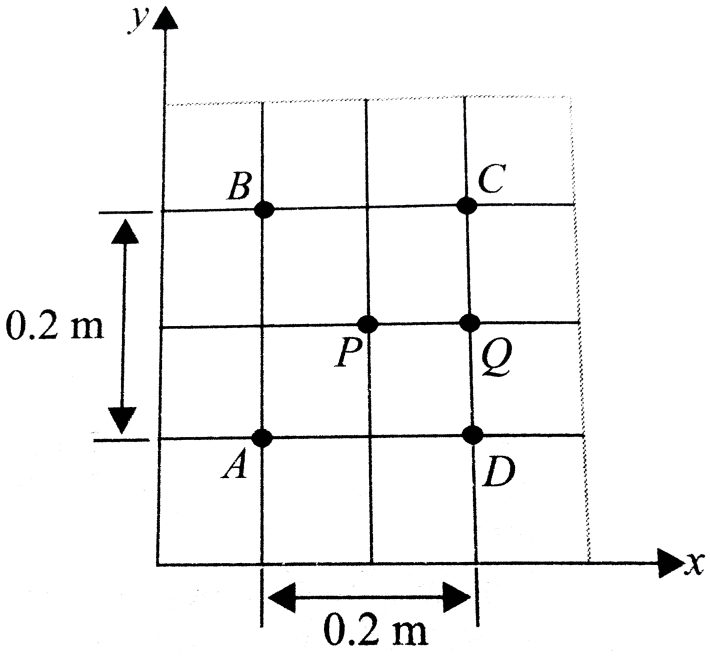
C. 10 V

D. 90 V

Answer: C

Watch Video Solution

27. A, B, C, D, P, and Q are points in a uniform electric field. The potentials at these points are $V(A) = 2V$. $V(P) = V(B) = V(D) = 5V$, and $V(C) = 8V$. Find the electric field at P.



A. $10\mathrm{Vm}^{-1}$ along PQ

B. $15\sqrt{2}\mathrm{Vm}^{-1}$ along PA

C. $5\mathrm{Vm}^{-1}$ along PC

D. $5\mathrm{Vm}^{-1}$ along PA

Answer: B

Watch Video Solution

28. The dipole moment of a system of charge $+q$ distribyted uniformly on an arc of radius R subtending an angle $\pi/2$ at its centre where another charge $-q$ is placed is :

A. $\frac{2\sqrt{2}qR}{\pi}$

B. $\frac{\sqrt{2}qR}{\pi}$

C. $\frac{qR}{\pi}$

D. $\frac{2qR}{\pi}$

Answer: A

Watch Video Solution

29. There are four concentric shells A,B, C and D of radii $a, 2a, 3a$ and $4a$ respectively. Shells B and D are given charges $+q$ and $-q$ respectively. Shell C is now earthed. The potential difference $V_A - V_C$ is $k = \left(\frac{1}{4\pi\varepsilon_0}\right)$

A. $\frac{Kq}{2a}$

B. $\frac{Kq}{3a}$

C. $\frac{Kq}{4a}$

D. $\frac{Kq}{6a}$

Answer: D

Watch Video Solution

30. Two capacitor having capacitances $8\mu F$ and $16\mu F$ have breaking voltage $20V$ and $80V$. They are combined in series. The maximum charge they can store individually in the combination is

A. $160\mu C$

B. $200\mu C$

C. $320\mu C$

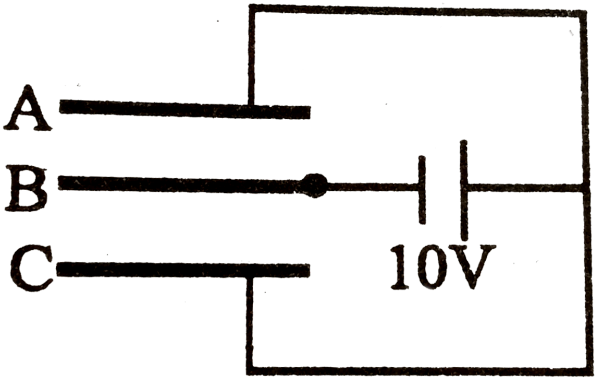
D. $480\mu C$

Answer: A

Watch Video Solution

31. Three plates A, B and C each of area $0.1m^2$ are separated by $0.885mm$ from each other as shown in the figure. A $10V$ battery is used

to charge the system. The enegry stored in the system is



A. $1\mu J$

B. $10^{-1}\mu J$

C. $10^{-2}\mu J$

D. $10^{-3}\mu J$

Answer: B

Watch Video Solution

32. A capacitor of capacitance C is initially charged to a potential difference of V volt. Now it is connected to a battery of $2V$ with oppoiste polarity. The ratio of heat generated to the final enegry stored in the capacitor will be

A. 1.75

B. 2.25

C. 2.5

D. 0.5

Answer: B

Watch Video Solution

33. A capacitor stores $60\mu C$ charge when connected across a battery. When the gap between the plates is filled with a dielectric, a charge of $120\mu C$ flows through the battery. The dielectric constant of the material inserted is:

A. 1

B. 2

C. 3

D. 4

Answer: C

Watch Video Solution

34. A charged capacitor is allowed to discharged through a resistor 2Ω by closing the switch K at the $t = 0$. At time $t = 2\mu s$, the reading of the falls half of its initial value. The resistance of ammeter is equal to

A. 0

B. 2Ω

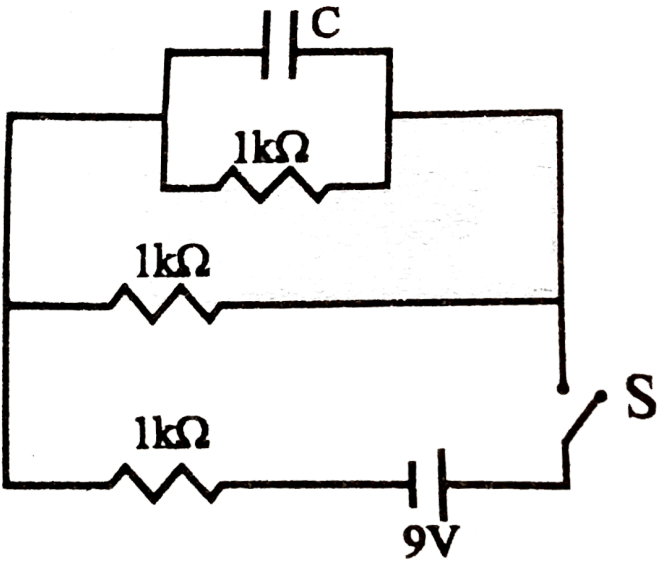
C. 4Ω

D. None of these

Answer: D

Watch Video Solution

35. A capacitor $C = 100\mu F$ is connected to three resistor each of resistance $1k\Omega$ and a battery of $emf 9V$.



The switch S has been closed for long time so as to charge the capacitor. When switch S is opened, the capacitor discharges with time constant

A. 33 ms

B. 5 ms

C. 100 ms

D. 50 ms

Answer: D

Watch Video Solution

36. A charged particle of charge 'Q' is held fixed and another charged particle of mass 'm' and charge 'q' (of the same sign) is released from a distance 'r'. The impulse of the force exerted by the external agent on the fixed charge by the time distance between 'Q' and 'q' becomes $2r$ is

A. $\sqrt{\frac{Qq}{4\pi\varepsilon_0 mr}}$

B. $\sqrt{\frac{Qqm}{4\pi\varepsilon_0 r}}$

C. $\sqrt{\frac{Qqm}{\pi\varepsilon_0 r}}$

D. $\sqrt{\frac{Qqm}{2\pi\varepsilon_0 r}}$

Answer: B

Watch Video Solution

37. In a regular polygon of n sides, each corner is at a distance r from the centre. Identical charges are placed at $(n-1)$ corners. At the centre, the intensity is E and the potential is V. The ratio V/E has magnitude

A. m

B. $r(n-1)$

C. $(n-1)/r$

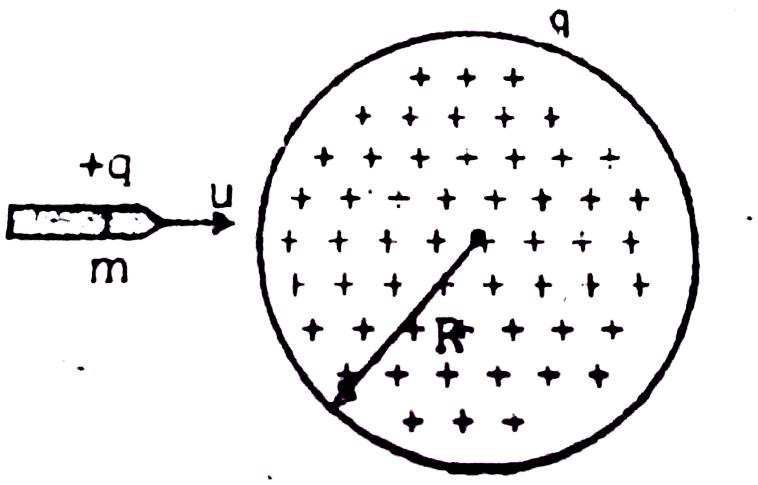
D. $r(n-1)/n$

Answer: B

Watch Video Solution

38. A bullet of mass m and charge q is fired towards a solid uniformly charge sphere of radius R and total charge +q. If it strikes the surface of sphere with speed u, find the minimum value of u so that it can penetrate

through the sphere. (Neglect all resistance force or friction acting on bullet except electrostatic forces)



A. $\frac{q}{\sqrt{2\pi\varepsilon_0 mR}}$

B. $\frac{q}{\sqrt{4\pi\varepsilon_0 mR}}$

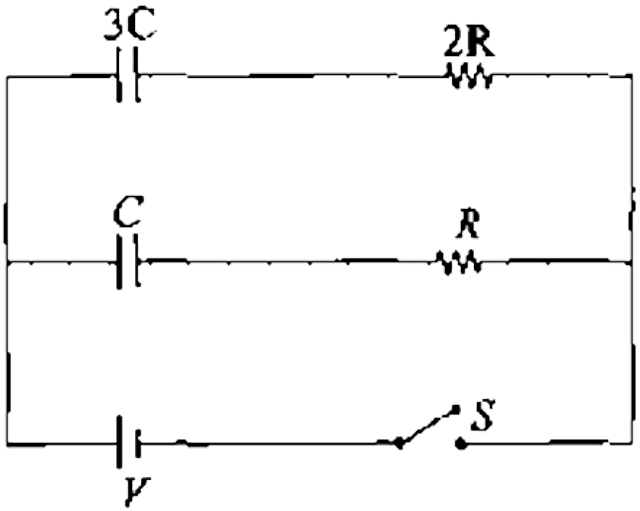
C. $\frac{q}{\sqrt{8\pi\varepsilon_0 mR}}$

D. $\frac{\sqrt{3}q}{\sqrt{4\pi\varepsilon_0 mR}}$

Answer: B

Watch Video Solution

39. In the circuit shown, switch Sis closed att=O. Let i_1 and $i_2$be the current at any finite time I, then the ratio i_1 / i_2 is



A. is consant

B. increases with time

C. decreases with time

D. first increases and then decreases

Answer: B

Watch Video Solution

40. A capacitor of capacitance C is allowed to discharge through a resistance R. The net charge flown through resistance during one time constant is (I_0 is the maximum current)

A. $CRI_0\left(\frac{1}{e}+1\right)$

B. $CRI_0\left(1-\frac{1}{e}\right)$

C. CRI_0

D. $\frac{CRI_0}{e}$

Answer: B

Watch Video Solution

41. A capacitor of capacitance $3\mu F$ is first charged by connecting it across a 10 V battery by closing key K_1. Then it is allowed to get discharged through 2Ω and 4Ω resistors by closing the key K_2. The total energy dissipated in the 4Ω resistor is equal to

A. 0.5 mJ

B. 0.05 mJ

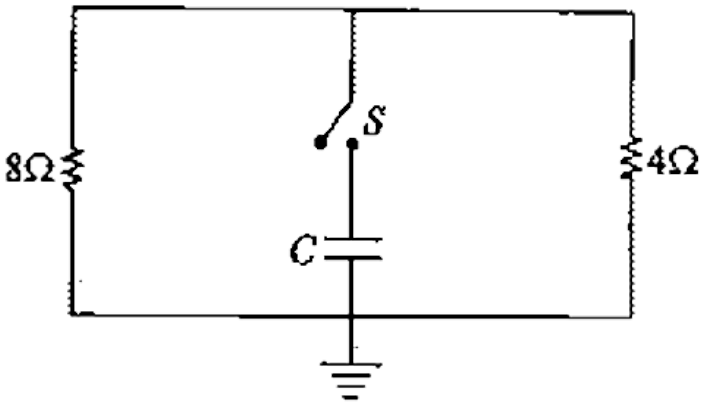
C. 0.1 mJ

D. 0.2 mJ

Answer: C

Watch Video Solution

42. A capacitor of capacitance $6\mu F$ and initial charge $160\mu C$ is connected with a switch S and resistors as shown in figure-3.346. If switch is closed at $t = 0$, then the currenithrough · resistor of 4Ω at $t = 16\mu s$ is



A. $\frac{10}{3e}A$

B. $\frac{10}{e}A$

C. $\frac{20}{3e}A$

D. None of these

Answer: C

Watch Video Solution

43. In the given circuit the quantity of charge that flows to ground long time after the swicth is closed is

A. $12\mu C$

B. $9\mu C$

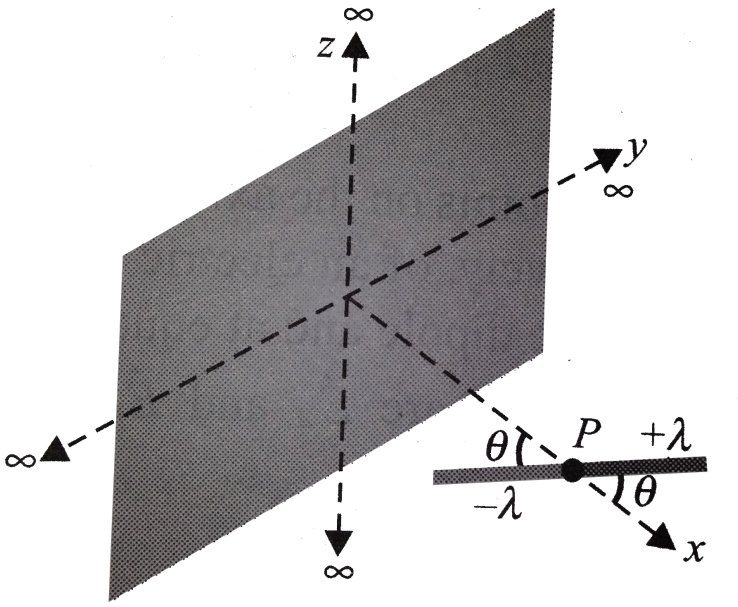
C. $13\mu C$

D. zero

Answer: D

Watch Video Solution

44. A large sheet carries uniform surface charge density σ . A rod of length 2l has a linear charge density λ on one half and $-\lambda$ on the second half. The rod is hinged at the midpoint O and makes an angle θ with the normal to the sheet. The torque experience by the rod is



A. $\frac{\sigma\lambda l}{2\varepsilon_0}$

B. $\frac{\sigma\lambda l^2}{2\varepsilon_0}$

C. $\frac{\sigma\lambda l^2}{\varepsilon_0}$

D. $\frac{\sigma\lambda l}{\varepsilon_0}$

Answer: B

Watch Video Solution

Comprehension

1. Two concentric spherical shells of radii R and 2R have charges Q and 2Q as shown in figure

If we draw a graph between potential V and distance r from the centre, the graph will be like

A. 

B. 

C.

D.

Answer: C

Watch Video Solution

2. Two concentric spherical shells of radii R and 2R have charges Q and 2Q as shown in figure

If we draw a graph between potential V and distance r from the centre, the graph will be like

A.

B.

C.

D.

Answer: A

Watch Video Solution

3. Two concentric spherical shells of radii R and 2R have charges Q and 2Q as shown in figure

Choose the correct optin $\left(K = \frac{1}{4\pi\varepsilon_0}\right)$

A. At a distance $r(R < r < 2R)$ from the centre electric potential is $\frac{KQ}{R}$

B. At the same distance, electric field is $\frac{KQ}{r^2}$

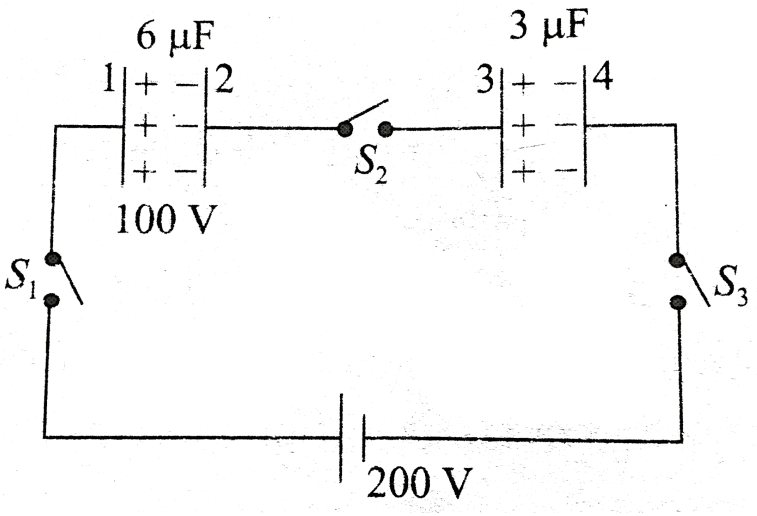
C. Both (a) and (b) are correct

D. Both (a) and (b) are wrong

Answer: B

Watch Video Solution

4. Two capacitors of capacity $6\mu F$ and $3\mu F$ are charge $100V$ and $50V$ separately and connected as shown in Now all the three switches S_1, S_(2) , and `S_(3) are closed.



Which plates form an isolated system?

A. plate 1 and plate 4 separately

B. plate 2 and plate 3 separately

C. plates 1 and 4 jointly

D. plates 2 and 3 jointly

Answer: D

Watch Video Solution

5. Two capacitros of capacity $6 \text{ and } 3\mu F$ are charged to 100 V and 50 V separately and connected as shown. Now all the three switches S_1, S_2 and S_3 are closed.

Charges on both the capacitors in steady state will be (on $6\mu F$ first)

A. $400\mu C, 400\mu C$

B. $700\mu C, 250\mu C$

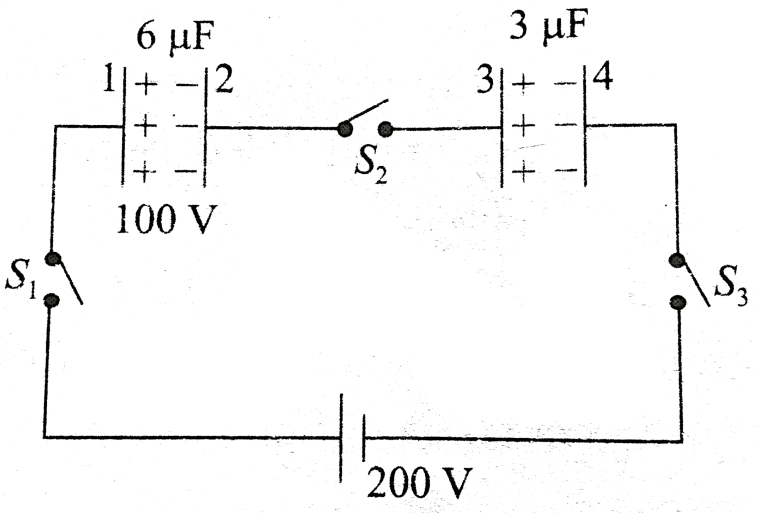
C. $800\mu C, 350\mu C$

D. $300\mu C, 450\mu C$

Answer: B

Watch Video Solution

6. Two capacitros of capacity $6\mu F$ are charged to 100 V and 50 V separately and connected as shown. Now all the three switches S_1, S_2 and S_3 are closed.



Suppose q_1, q_2 and q_3 be the magnitudes of charge flown from switches S_1, S_2 and S_3 after they closed. Then

A. $q_1 = q_3$ and $q_2 = 0$

B. $q_1 = q_3 = \frac{q_2}{2}$

C. $q_1 = q_3 = 2q_2$

D. $q_1 = q_2 = q_3$

Answer: D

Watch Video Solution

7. A charge $q = \left(-2 \times 10^{-9} \right)$ is placed at (1 m, 2m, 3m). There is a point

$P = (2m, \ -3m, 4m)$

A unit vector in the direction of electric field at P due to charge q will be

A. $\frac{1}{3\sqrt{3}}\left(\hat{i} - 5\hat{j} + \hat{k}\right)$

B. $\frac{1}{3\sqrt{3}}\left(-\hat{i} + 5\hat{j} - \hat{k}\right)$

C. $\frac{1}{5\sqrt{2}}\left(3\hat{i} - 4\hat{j} + 5\hat{k}\right)$

D. $\frac{1}{5\sqrt{2}}\left(-3\hat{i} + 4\hat{j} - 5\hat{k}\right)$

Answer: B

Watch Video Solution

8. A charge $q = \left(-2x10^{-9} \right)$ is placed at (1 m, 2m, 3m). There is a point $P = (2m, -3m, 4m)$

Component of electric field along x-axis at point would be

A. $\frac{1}{5\sqrt{3}} N/C$

B. $\frac{9}{5\sqrt{3}} N/C$

C. $\frac{2}{9\sqrt{3}} N/C$

D. $8\sqrt{3} N/C$

Answer: C

Watch Video Solution

9. Electric potential is a scalar quantity. Due to a point charge charge q at distance r, the potential is given by $V = \frac{q}{4\pi \in_0 r}$. A point charge q is placed at $(3a, 0)$ and another charge $-2q$ is placed at $(-3a, 0)$.

At how many points on the x-axis, (at finite distance) electric potential will be zero?

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

10. Electric potential is a scalar quantity. Due to a point charge charge q at distance r, the potential is given by $V = \frac{q}{4\pi \in_0 r}$. A point charge q is placed at $(3a, 0)$ and another charge $-2q$ is placed at $(-3a, 0)$.

If we plot a graph of potential (V) on x-axis it will be like:

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

11. A capacitor is connected to a variable source of potential. Current flowing in the circuit and potential across the plates of capacitor at time t are shown in figure.

Capacity of the capacitor is

A. 1 F

B. 2 F

C. 3 F

D. 4 F

Answer: B

Watch Video Solution

12. A capacitor is connected to a variable source of potential. Current flowing in the circuit and potential across the plates of capacitor at time t are shown in figure.

At $t = 2s$, energy is stored in the capacitor at a rate of

A. a. 50 J/s

B. b. 100 J/s

C. c.150 J/s

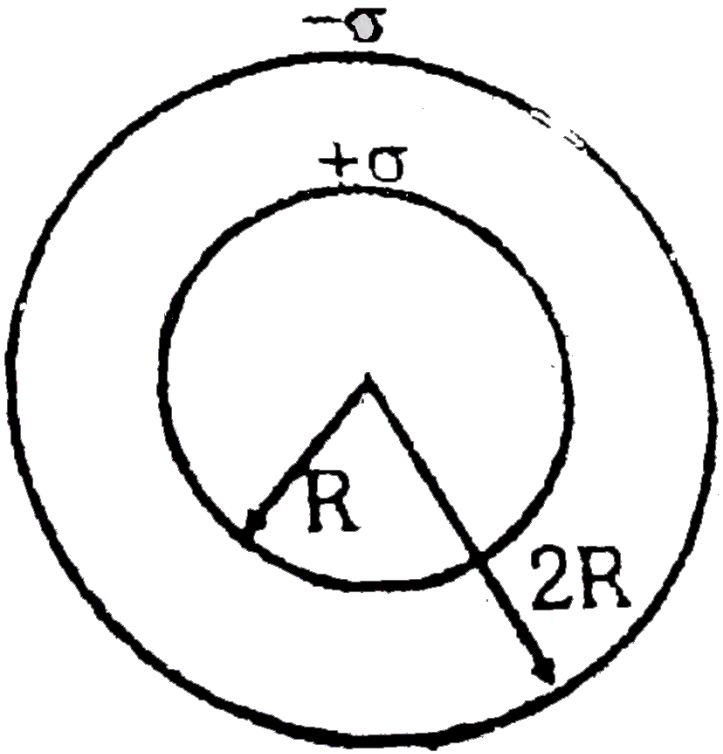
D. d. 200 J/s

Answer: B

Watch Video Solution

13. When two concentric shells are connected by a thin conducting wire, whole of the charge of inner shell transfers to the outer shell and potential difference between them becomes zero. Surface charge

densities of two thin concentric spherical shells are σ and $-\sigma$ respectively. Their radii are R and $2R$. Now they are connected by a thin wire.



Potential on either of the shells will be :-

A. $-\frac{3\sigma R}{2\varepsilon_0}$

B. $\frac{2\sigma R}{\varepsilon_0}$

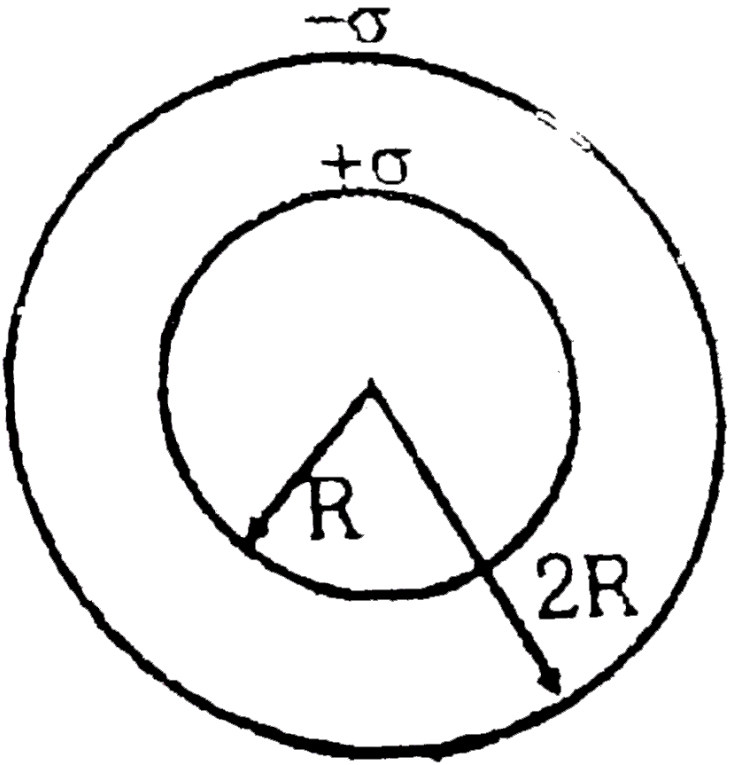
C. $-\frac{\sigma R}{2\varepsilon_0}$

D. zero

Answer: A

Watch Video Solution

14. When two concentric shells are connected by a thin conducting wire, whole of the charge of inner shell transfers to the outer shell and potential difference between them becomes zero. Surface charge densities of two thin concentric spherical shells are σ and $-\sigma$ respectively. Their radii are R and $2R$. Now they are connected by a thin wire.



Suppose electric field at a distance $r(>2R)$ was E_1 before connecting the two shells and E_2 after connecting the two shells, then $\left|\frac{E_2}{E_1}\right|$ is :-

A. zero

B. 1

C. 2

D. $\frac{1}{2}$

Answer: B

Watch Video Solution

15. In $C - R$ circuit, answer the following two questions

During charging of $C - R$ circuit let t_1 and i_1 be the time constant and initial charging current when capacitor is assumed to be filled by a perfect insulator and t_2 and i_2 be the corresponding values when it is assumed imperfect. Then

A. $t_1 < t_2$

B. $i_1 > i_2$

C. Both (a) and (b) are correct

D. Both (a) and (b) are wrong

Answer: C

Watch Video Solution

16. In $C - R$ circuit, answer the following two questions

Dielectric constant of the slab between plates of a capacitor is 18 and its resistivity is $\left(4\pi \times 10^3\right)\Omega - m$. Then time constant of this capacitor when directly connected to a battery will be

A. $2\mu s$

B. $3\mu s$

C. $1\mu s$

D. $9\mu s$

Answer: A

Watch Video Solution

17. In the figure $m_A = m_B = 1kg$. Block A is neutral while $q_B = -1C$. Sizes of A and B are negligible. B is released from rest at a distance 1.8 m fromt A. Initially spring is neither compressed nor elongated.

If collision between A and B is perfectly inelastic, what is velocity of combined mass just after collision ?

A. 6 m/s

B. 3 m/s

C. 9 m/s

D. 12 m/s

Answer: B

Watch Video Solution

18. In the figure $m_A = m_B = 1kg$. Block A is neutral while $q_B = -1C$. Sizes of A and B are negligible. B is released from rest at a distance 1.8 m fromt A. Initially spring is neither compressed nor elongated.

Equilibrium position of the combined mass is at x = ...m.

A. $-\frac{2}{9}$

B. $-\frac{1}{3}$

C. $-\frac{5}{9}$

D. $-\frac{7}{9}$

Answer: C

Watch Video Solution

19. In the figure $m_A = m_B = 1kg$. Block A is neutral while $q_B = -1C$. Sizes of A and B are negligible. B is released from rest at a distance 1.8 m fromt A. Initially spring is neither compressed nor elongated.

The amplitude of oscillation of the combined mass will be

A. $\frac{2}{3}m$

B. $\frac{\sqrt{124}}{3}m$

C. $\frac{\sqrt{72}}{9}m$

D. $\frac{\sqrt{106}}{9}m$

Answer: D

Watch Video Solution

20. A solid conducting sphere of radius 'a' is surrounded by a thin uncharged concentric conducting shell of radius $2a$. A point charge q is placed at a distance $4a$ from common centre of conducting sphere and shell. The inner sphere is then grounded

The charge on solid sphere is

A. $-\frac{q}{2}$

B. $-\frac{q}{4}$

C. $-\frac{q}{8}$

D. $-\frac{q}{16}$

Answer: B

Watch Video Solution

21. A solid conducting sphere of radius 'a' is surrounded by a thin uncharged concentric conducting shell of radius $2a$. A point charge q is placed at a distance $4a$ from common centre of conducting sphere and shell. The inner sphere is then grounded

Pick up the correct statement.

A. Charge on surface of inner sphere is non-uniformly distributed

B. Charge on inner surface of outer shell is non-uniformly distributed

C. Charge on outer surface of outer shell is non-uniformly distributed

D. All the above statement are false

Answer: C

Watch Video Solution

22. A solid conducting sphere of radius 'a' is surrounded by a thin uncharged concentric conducting shell of radius $2a$. A point charge q is

placed at a distance $4a$ from common centre of conducting sphere and shell. The inner sphere is then grounded

The potential of outer shell is

A. $\frac{q}{32\pi\varepsilon_0 a}$

B. $\frac{q}{16\pi\varepsilon_0 a}$

C. $\frac{q}{8\pi\varepsilon_0 a}$

D. $\frac{q}{4\pi\varepsilon_0 a}$

Answer: A

Watch Video Solution

23. Capacitor C_3 in the circuit is a veriable capacitor (its capacitance can be varied). Group is plotted between potential difference V_1 (across capacitor C_1) versus C_3. Electric potential V_1 approaches to 10 V as $C_3 \to \infty$. Given that $C_1 + C_2 = 10\mu F$

EMF of the battery is equal to

A. 10 V

B. 12 V

C. 16 V

D. 20 V

Answer: A

Watch Video Solution

24. Capacitor C_3 in the circuit is a variable capacitor (its capacitance can be varied). Graph is plotted between potential difference V_1 (across capacitor C_1) versus C_3. Electric potential V_1 approaches to 10 V as $C_3 \to \infty$. Given that $C_1 + C_2 = 10\mu F$

The capacitance of the capacitor C_1 value

A. (a) $2\mu F$

B. (b) $6\mu F$

C. (c) $8\mu F$

D. (d) $4\mu F$

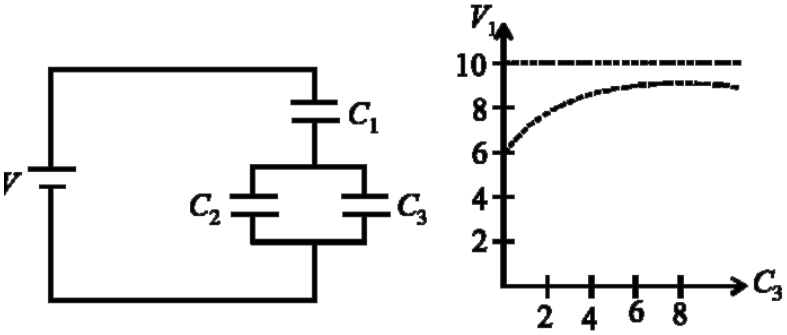
Answer: B

Watch Video Solution

25. Capacitor C_3 in the circuit is variable capacitor (its capacitance can be varied). Graph is plotted between potential difference V_1 (across capacitor C_1) versus C_3.

Electric potential V_1 approaches on asymptote of 10 volts as $C_3 \to \infty$

The value of C3 for which potential difference across C_1 will become 8V, is



A. $1.5C_1$

B. $2.5C_1$

C. $3.5C_1$

D. $4.5C_1$

Answer: A

Watch Video Solution

26. Four metallic plates placed as shown in the figure. Plate 2 is given a chart Q whereas all other plates are uncharged. Plates 1 and 4 are joined together. The area of each plate is same

The charge appearing on the right side of plate 3 is

A. zero

B. $+Q/4$

C. $-3Q/4$

D. $Q/2$

Answer: B

Watch Video Solution

27. Four metallic plates placed as shown in the figure. Plate 2 is given a chart Q whereas all other plates are uncharged. Plates 1 and 4 are joined together. The area of each plate is same

The charge appearing on the right side of plate 4 is

A. zero

B. $-Q/4$

C. $-3Q/4$

D. $Q/2$

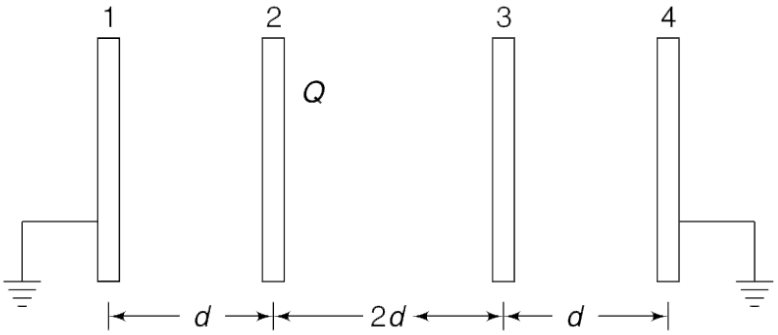
Answer: D

Watch Video Solution

28. Four large identical metallic plates are placed as shown in the Figure. Plate 2 is given a charge Q. All other plates are neutral. Now plates 1 and 4 are earthed. Area of each plate is A.

(a) Find charge appearing on right side of plate 3.

(b) Find potential difference between plates 1 and 2.



A. $\frac{3}{2}\frac{Qd}{\varepsilon_0 A}$

B. $\frac{Qd}{\varepsilon_0 A}$

C. $\frac{3}{4}\frac{Qd}{\varepsilon_0 A}$

D. $\frac{3Qd}{\varepsilon_0 A}$

Answer: C

Watch Video Solution

29. The figure shows a arrangement of capacitors and a battery.

Identify the correct statements

A. Both the $4\mu F$ capacitors carry different charges

B. Both the $4\mu F$ capacitors parry equal charges

C. $V_B - V_D > 0$

D. $V_D - V_B > 0$

Answer: B::C

Watch Video Solution

30. The figure shows a arrangement of capacitors and a battery.

If the potential of C is zero, then

A. $V_A = +20V$

B. $4(V_A - V_B) + 2(V_D - V_B) = 2V_B$

C. $2(V_A - V_D) + 2(V_B - V_D) = 4V_D$

D. $V_A = V_B + V_D$

Answer: A

Watch Video Solution

31. The figure shows a arrangement of capacitors and a battery.

The potential of the points B and D are (if $V_C = 0$)

A. a. $V_B = 8V$

B. b. $V_B = 12V$

C. c. $V_D = 8V$

D. d. $V_D = 12V$

Answer: B::C

Watch Video Solution

32. In the circuit shown in the figure, in steady state:

The charge on $5\mu F$ capacitor is

A. $30\mu C$

B. $40\mu C$

C. $50\mu C$

D. $60\mu C$

Answer: A

Watch Video Solution

33. In the circuit shown in the figure, in steady state:

The current drawn from the battery is

A. $2A$

B. $3A$

C. $4A$

D. $1A$

Answer: D

Watch Video Solution

34. Four large metallic plates of area A each are kept parallel to each other with a small separation between them as shown in the figure. A cell of emf V is connected across the two outermost plates through a switch K_1. The two inner plates are similarly connected with a cell of emf 2 V through a switch k_2 Initially both switched are open and the plates, starting form left to right (i.e. number 1 to 4) are given charges $Q, 2Q, -2Q$ and $-Q$ respectively. Now answer the following questions

The charge appearing on the outer surface of plate -1, when switches K_1, K_2 are open

A. zero

B. Q/e number of electrons will flow from outer to inner shell, where 'e' is the charge on an electron

C. $-Q$

D. $-3Q$

Answer: A

Watch Video Solution

35. Four large metallic plates of area A each are kept parallel to each other with a small separation between them as shown in the figure. A cell of emf V is connected across the two outermost plates through a switch K_1. The two inner plates are similarly connected with a cell of emf 2 V through a switch k_2 Initially both switched are open and the plates, starting form left to right (i.e. number 1 to 4) are given charges $Q, 2Q, -2Q$ and $-Q$ respectively. Now answer the following questions

If K_1 is closed and K_2 is open the charge appearing on the right surface of plate-2 is

A. $\frac{Q}{2} + \left(\frac{\varepsilon_0 A}{d}\right)\frac{V}{4}$

B. $\left(\frac{\varepsilon_0 A}{d}\right)\frac{V}{4} + \frac{3Q}{2}$

C. $\left(\frac{\varepsilon_0 A}{d}\right)\frac{V}{4} - \frac{Q}{2}$

D. $\frac{3Q}{2}$

Answer: B

Watch Video Solution

36. Four large metallic plates of area A each are kept parallel to each other with a small separation between them as shown in the figure. A cell of emf V is connected across the two outermost plates through a switch K_1. The two inner plates are similarly connected with a cell of emf 2 V through a switch k_2 Initially both switched are open and the plates, starting form left to right (i.e. number 1 to 4) are given charges $Q, 2Q, -2Q$ and $-Q$ respectively. Now answer the following questions

If both switches are closed, the charge appearing on the plate 4 is

A. $\left(\frac{\varepsilon_0 A}{d}\right)V$

B. $Q+\frac{\varepsilon_0 A}{d}\left(\frac{V}{2}\right)$

C. $Q-\frac{\varepsilon_0 A}{d}\left(\frac{V}{2}\right)$

D. $\left(\frac{\varepsilon_0 A}{d}\right)\left(\frac{V}{3}\right)$

Answer: D

Watch Video Solution

Matrix Matching

1. Match the following

	Table - 1		Table - 2
(A)	σ^2/ε_0	(P)	$C^2/J-m$
(B)	ε_0	(Q)	Farad
(C)	$\frac{\text{ampere - second}}{\text{Volt}}$	(R)	J/m^3
(D)	$\frac{V}{E}$	(S)	metre

Watch Video Solution

2. Match the following . When an independent positive charge moves from higher potential to lower potential, then

	Table - 1		Table - 2
(A)	its kinetic energy	(P)	will remain constant
(B)	its potential energy	(Q)	will decrease
(C)	its mechanical energy	(R)	will increase

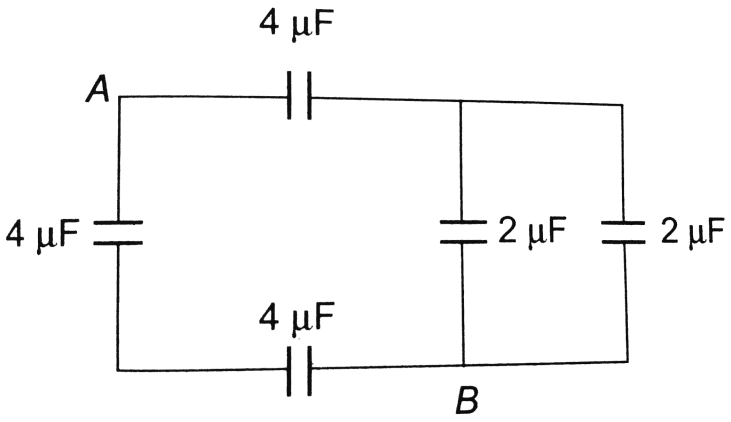
Watch Video Solution

Integer

1. The centres of two identical small conducting sphere are 1 m apart. They carry charge of opposite kind and attract each other with a force F. when they connected by conducting thin wire they repel each other with a force $F/3$. The ratio of magnitude of charges carried by the spheres initially in $n:1$. Find value of n

Watch Video Solution

2. In the circuit as shown in the figure the effective capacitance between A and B is



Watch Video Solution

3. A $2\mu F$ condenser is charged upto 200 volt and then battery is removed. On combining this with another uncharged condenser in parallel, the potential difference is found to be 40 volt. Find the capacity of second condenser (in μF)

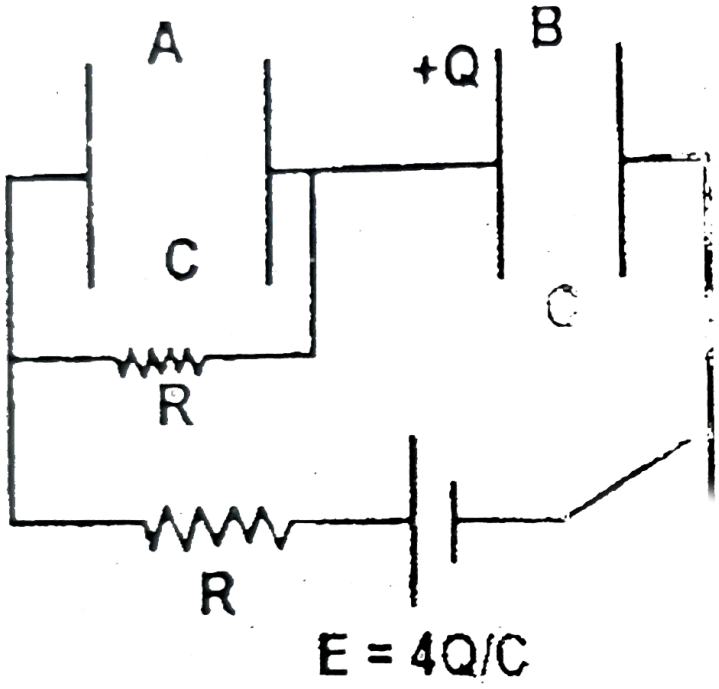
Watch Video Solution

4. A hollow sphere of radius 2R is charged to V volts and another smaller sphere of radius R is charged to $V/2$ volts. Then the smaller sphere is placed inside the bigger sphere without changing the net charge on each sphere. The potential difference between the two spheres would becomes V/n. find value of n

Watch Video Solution

5. Consider the circuit shown in the figure. Capacitors A and B, each have capacitance $C = 2F$. The plates of capacitor A are connected by a wire of resistance $R = 1\Omega$ while capacitor B is given an initial charge $Q = 4C$. The switch is closed at time $t = 0$. what will be the initial currect (in

ampere) drawn from the battery immediately after the switch is closed ?

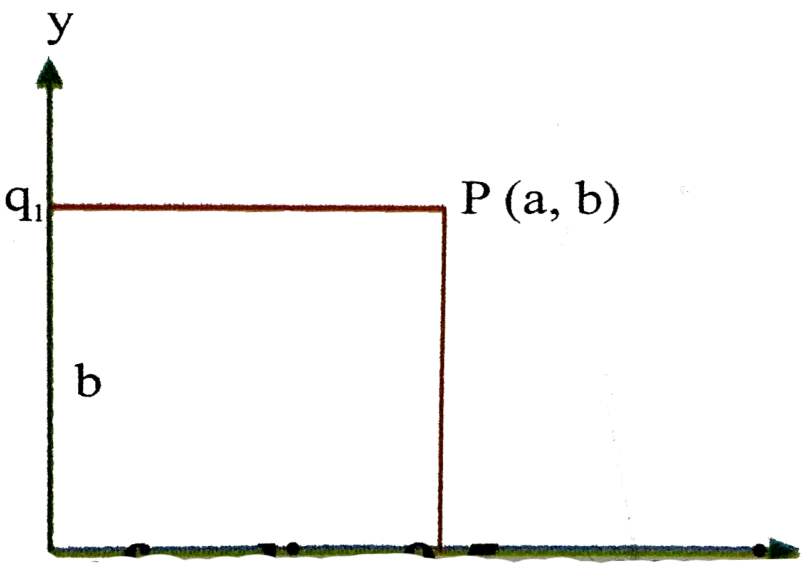


Watch Video Solution

6. Four point charge $q, \ -q, 2Q$ and Q are placed in order at the corners A, B, C and D of a square. If the field at the midpoint of CD is zero then the value of q/Q is $\frac{5\sqrt{5}}{x}$. Find the value of x.

Watch Video Solution

7. Two point charge $q_1 = 2\mu C$ and $q_2 = 1\mu C$ are placed at distance $b = 1$ and $a = 2cm$ from the origin on the y and x axes as shown in figure .The electric field vector at point (a, b) will subtend on angle θ with the "x-axis" given by



Watch Video Solution

8. Two identical charges are placed at the two corners of an equilateral triangle. The potential energy of the system is U. The work done in bringing an identical charge from infinity to the third vertex is

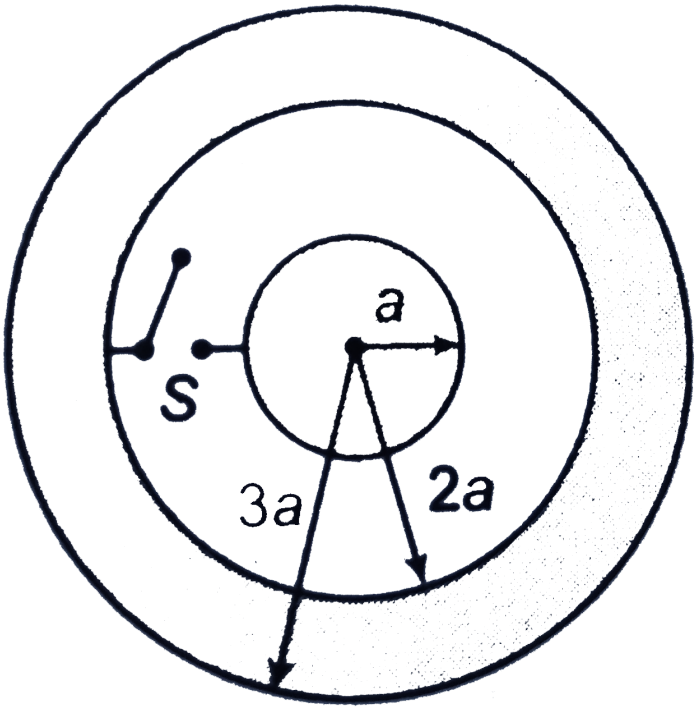
Watch Video Solution

9. There are four concentric shells A,B, C and D of radii a, $2a$, $3a$ and $4a$ respectively. Shells B and D are given charges $+q$ and $-q$ respectively. Shell C is now earthed. The potential difference $V_A - V_C$ is $k = \left(\frac{1}{4\pi\varepsilon_0}\right)$

Watch Video Solution

10. A solid conducting sphere of radius a having a charge q is surrounded by a concentric conducting spherical shell of inner radius $2a$ and outer radius $3a$ as shown in figure. Find the amount of heat porduced when

switch is closed $\left(k = \frac{1}{4\pi\varepsilon_0}\right)$

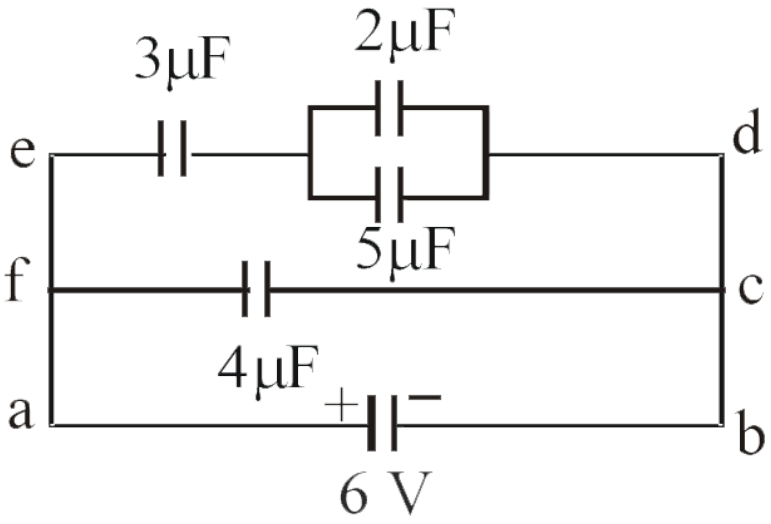


Watch Video Solution

11. Electric field at the centre of uniformly charge hemispherical shell of surface charge density σ is $\frac{\sigma}{n\varepsilon_0}$ then find the value of n.

Watch Video Solution

12. In the circuit given below, the charge in μC, on the capacitor having $5\mu F$ is



Watch Video Solution

13. A parallel plate capacitor is connected to a battery of emf V volts. Now a slab of dielectric constant $k = 2$ is inserted between the plates of capacitor without disconnecting the battery. The electric field between the plates of capacitor after inserting the slab is $E = \frac{PV}{2d}$. Find the value of P.

Watch Video Solution

14. Four identical metal plates are arranged as shown plates 1 and 4 are connected by a connecting wire. A battery of emf V volts is connected between plates 2 and 3. The electric field between plates 3 and 4 is $\frac{2V}{Kd}$. Find the value of K

A. 4

B. 5

C. 6

D. 8

Answer: 6

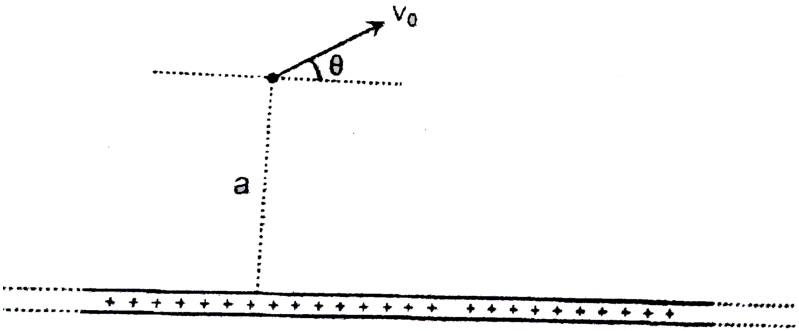
Watch Video Solution

15. Four identical positive point charges Q are fixed at the four corners of a square of side length l. Another charged particle of mass m and charge

$+q$ is projected towards centre of square from a large distance along the line perpendicular to plane of square. The minimum value of initial velocity v_0 (in m/s) required to cross the square is ?

$\left(m = 1gm, l = 4\sqrt{2}m, Q = 1\mu c, q = 0.5\mu c\right)$

Watch Video Solution

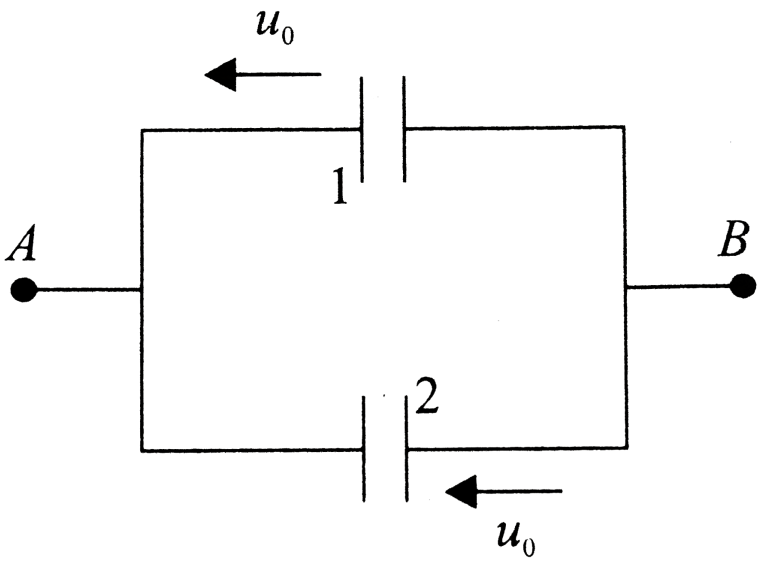


16.

There is an infinite line of uniform linear density of charge $+\lambda$. A particle of charge $-q$ & mass m is projected with initial velocity v_0 at an angle θ with the line of charge from a distance a from it. The point charge moves in plane containing line charge and point of projection The speed of the particle of found to be minimum when it's distance from the line of charge is $ae^{\left(n\pi m\varepsilon_0^2/q\lambda\right)}$. The value of n is (ingnore gravity)

Watch Video Solution

17. Two identical capacitors haveng plate separation d_0 are connected parallel to each other across the points A and B as shown in. A charge Q is imparted to the system by removed Now the first plate of the first capacitor and the second plate of the second capacitor start moving with constant velocity u_0 toward left. Find the magnitude of the current flouing in the loop during this process.



Watch Video Solution

Others

1. Which of the following is/are incorrect statement ?

A. Electric field is always conservative

B. Electric field die to a varying magnetic field is non-conservative

C. Electri field due to stationary charge is conservative

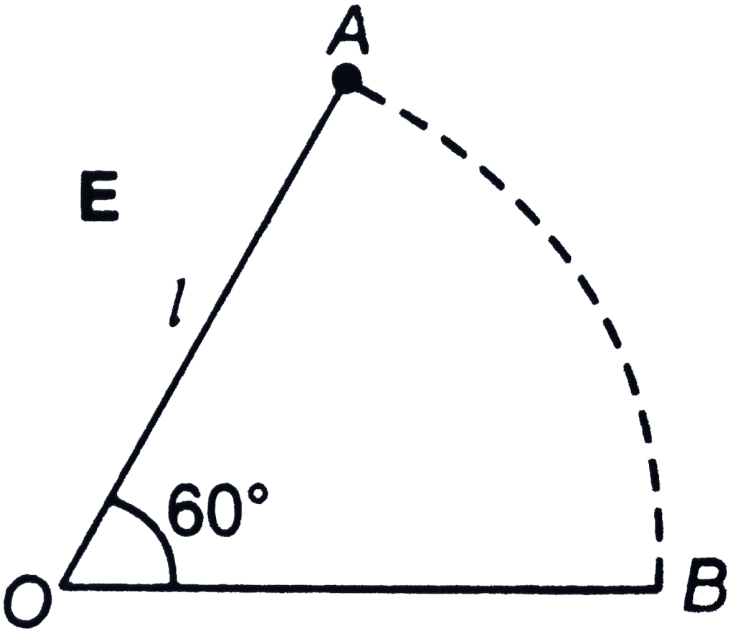
D. Electric field lines are always closed loops

Answer: A::D

Watch Video Solution

2. A particle of mass m and charge q is fastened to one end of a string of length. The other end of the string is fixed to the point O. The whole sytem liles on as frictionless horizontal plane. Initially, the mass is at rest at A. A uniform electric field in the direction shown in then switfched on.

Then



A. the speed of the particle when it reaches B is $\sqrt{\frac{2qEl}{m}}$

B. the speed of the particle when it reaches B is $\sqrt{\frac{qEl}{m}}$

C. the tension in the string when particle reaches at B is 2qE

D. the tension in the string when the particle reaches at B is qE

Answer: B::C

Watch Video Solution

3. An electric dipole moment $\vec{P} = \left(2.0\hat{I} + 3.0\hat{j}\right)\mu Cm$ is placed in a uniform electric field

$\vec{E} = \left(3\hat{I} + 2.0\hat{k}\right) \times 10^5 NC^{-1}$.

A. The torque that E exerts in p is $\left(0.6\hat{i} - 0.4\hat{j} - 0.9\hat{k}\right)Nm$

B. The potential energy of the dipole is $-0.6J$

C. The potential energy of the dipole is 0.6 J

D. If the dipole is rotated in the electric field, the maximum potential energy of the dipole is 1.3 J

Answer: A::B::D

Watch Video Solution

4. A capacitor C is charged to a potential V by a battery. It is then disconnected from the battery and again connected with its polarity reversed to the battery

A. The work done by the battery is CV^2

B. The total charge the passes through battery is 2 CV

C. The initial and final energy of the capacitor is same

D. The work done by the battery is $2CV^2$

Answer: B::C::D

Watch Video Solution

5. Five charges each q are placed at five corners regular pentagon. Distance from corner to the centre of pontagon is r. Then $\left(K = \frac{1}{4\pi\varepsilon_0}\right)$

A. potential at centre is $\frac{5kq}{r}$

B. potential at centre is zero

C. electric field at centre is non-zero

D. electric field at centre is zero

Answer: A::D

Watch Video Solution

6. Two point charges q each are fixed at (a,0) and (-a,0). A third charge Q is placed at origin. Electrons potential energy of the system will

A. increase if Q is slightly displaced along x-axis

B. decrease if Q is slightly displaced along x-axis

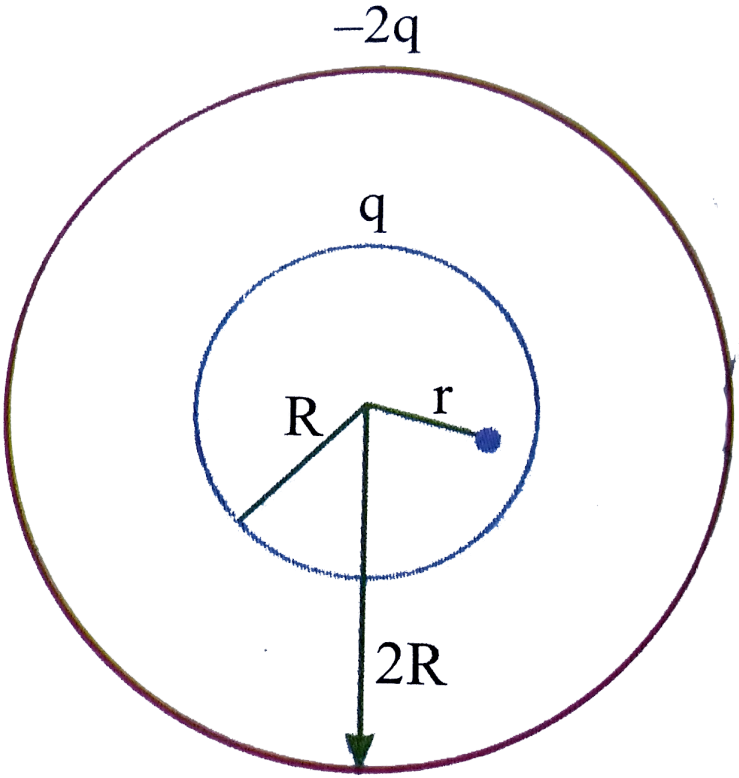
C. increase if Q is slightly displaced along y-axis

D. decrease if Q is slightly displaced along y-axis

Answer: A::D

Watch Video Solution

7. Two concentric shells of radii R and $2R$ have given charge q and $-2q$ as shown in figure in a region $r < R$



(a) $E = 0$,(b) $E \neq 0$,(c) $V = 0$ (d) $V \neq 0$

A. $E = 0$

B. $E \neq 0$

C. $V = 0$

D. $V \neq 0$

Answer: A::C

Watch Video Solution

8. A positive charged particle when moves from higher potential to lower potential

A. its potential energy must decrease

B. it potential energy may decrease

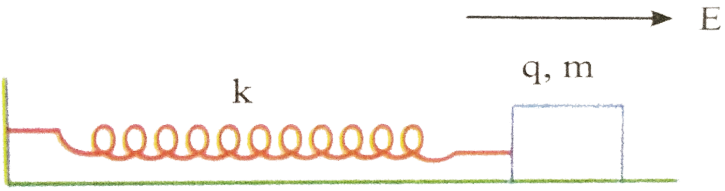
C. its kinetic energy must increase

D. its kinetic energy may increase

Answer: A::D

Watch Video Solution

9. A block of mass m is attached to a spring of force constant k .Charges on the block is q. A horizontal electric field E is acting in the directions as shown.Block is released with the spring in unstretched position



(a) block will execute SHM

(b) time period of osciallation is $2\pi\frac{\sqrt{m}}{k}$

(c) amplitude of oscillation is $\frac{qE}{k}$

(d) Block will oscillate but not simple harmonically

choose the correct answer

A. Block will execute SHM

B. Time period of oscillation is $2\pi\sqrt{\frac{m}{k}}$

C. Amplitude of oscillation is $\frac{qE}{k}$

D. Block will oscillate but not simple harmonically.

Answer: A::B::C

Watch Video Solution

10. An electric dipole of dipole moment 10^{-6} C-m is released from rest in uniform electric field $10^2 V/m$ at angle $\theta = 60^\circ$. Maximum rotational kinetic energy of the dipole is say K and maximum torque during the motion is τ, then

A. $K = 5.0 \times 10^{-5} J$

B. $K = 2.0 \times 10^{-4} J$

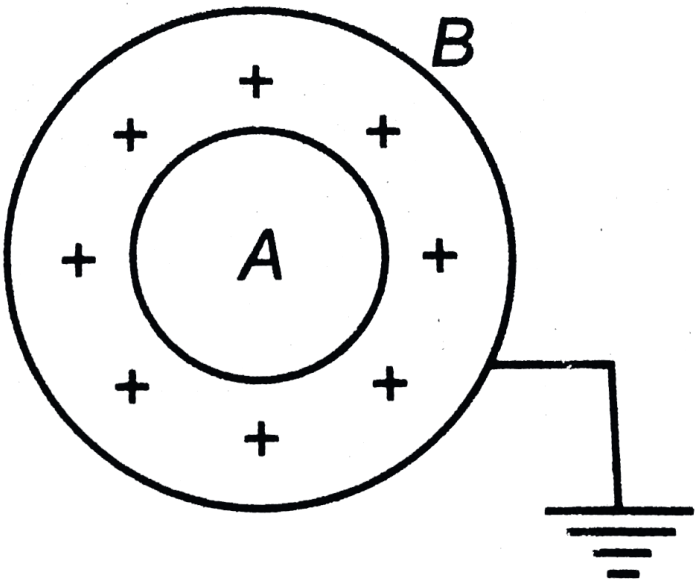
C. $\tau = 5.0 \times 10^{-4}$ N-m

D. $\tau = 8.7 \times 10^{-5}$ N-m

Answer: A::D

Watch Video Solution

11. A and B are two concentric spherical shells. If A is given a charge $+Q$ while B is earthed as shown in figure then



A. the charge appearing on inner surface of B is $-Q$

B. the field inside and outside A is zero

C. the fieldm between A and B is not zero

D. the charge appearing on outer surface of B is zero

Answer: A::C::D

Watch Video Solution

12. Rows of capacitors $1, 2, 4, 8. \ldots . \infty$ capacitors, each of capacitance $2\mu F$, are connected in parallel as shown in figure. The potential difference across AB = 10 V, then

A. a. Total capacitance across AB is $4\mu F$

B. b. Charge of each capacitor will be same

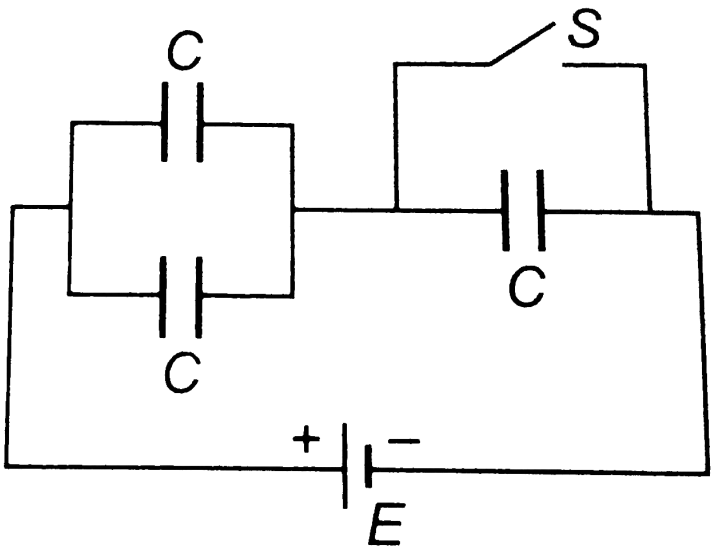
C. c. Charge on the capacitor in the first row is more than on any other capacitor

D. d. Energy of all the capacitors is $200\mu J$

Answer: A::C::D

Watch Video Solution

13. In the circuit shown each capacitor has a capcitance C. The emf of the celll is E. If the switch S is closed then



A. positive charge will flow out of the positive terminal of the cell

B. positive charge will enter the positive terminal of the cell

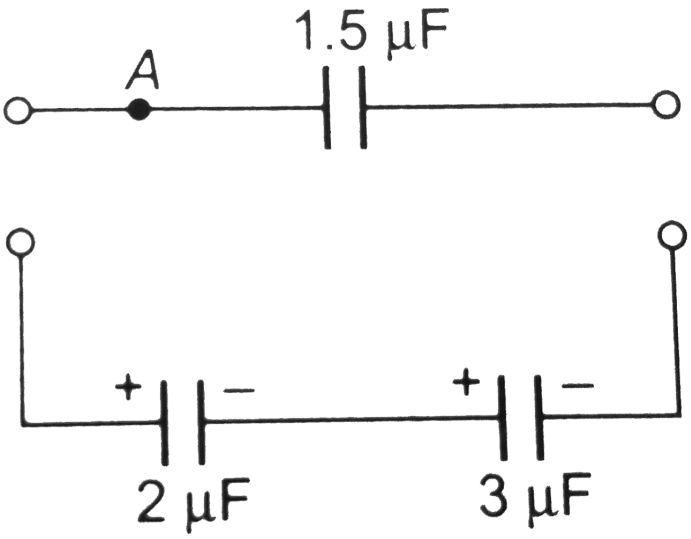
C. the amount of charge flowing through the cell will be CE

D. the amount of charge flowing through the cell will be $\frac{4}{3}CE$

Answer: A::D

Watch Video Solution

14. Two capacitors of $2\mu F$ and $3\mu F$ are charged to $150V$ and $120V$, respectively. The plates of capacitor are connected as shown in the figure. An uncharged capacitor of capacity $1.5\mu F$ falls to the free end of the wire. Then



A. charge on the $1.5\mu F$ capacitor is $20\mu C$

B. charge on the $2\mu F$ capacitor is $280\mu C$

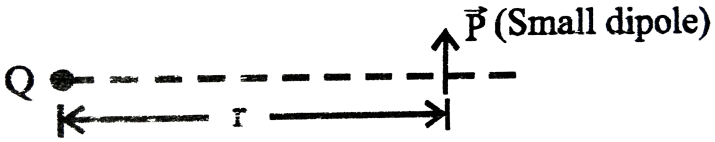
C. positive charge flows through A from right to left

D. positive charge flows through A from left to right

Answer: A::B::C

Watch Video Solution

15. For the situation shown in the figure below ("assume "$r > >$ length of dipole) mark out the correct statement (s) -



A. Force acting on the dipole is zero

B. Force acting on the dipole is approximately $\frac{pQ}{4\pi\varepsilon_0 r^3}$

C. Torque acting on the dipole is $\frac{pQ}{4\pi\varepsilon_0 r^2}$ in clockwise direction

D. Torque acting on the dipole is $\frac{pQ}{4\pi\varepsilon_0 r^2}$ in anticlockwise direction

Answer: B::C

Watch Video Solution

16. Units of electric flux are

A. $\frac{\text{N-m}^2}{C}$

B. $\frac{N}{C - m^2}$

C. Volt-m

D. Volt-m^3

Answer: A::C

Watch Video Solution

17. A circuit shown in the figure consists of a battery of emf $10V$ and two capacitance C_1 and C_2 of capacitances $1.0\mu F$ and $2.0\mu F$ respectively. The potential difference $V_A - V_B$ is $5V$

A. charge on capacitor C_1 is equal to charge on Capacitor C_2

B. voltage across capacitor C_1 is 5 V

C. voltage across capacitor C_2 is 10 V

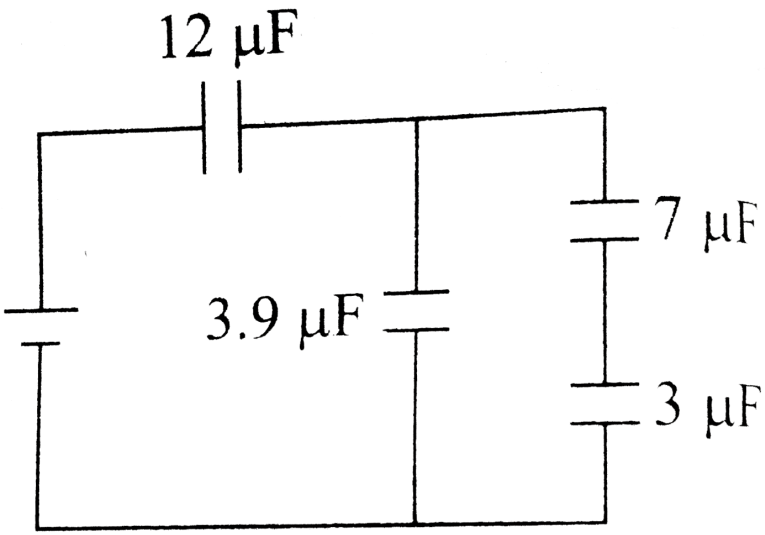
D. energy stored in capacitor C_1 is two times the energy stored in capacitor C_2

Answer: A::D

Watch Video Solution

18. Four capacitors and a battery are connected as shown in. If the potential difference aross the $7\mu F$ capacitor is $6V$, then which of the

following statement(s) is//are correct?



A. potential difference across the $3\mu F$ capacitor is 10 V

B. charge on the $3\mu F$ capacitor is $42\mu C$

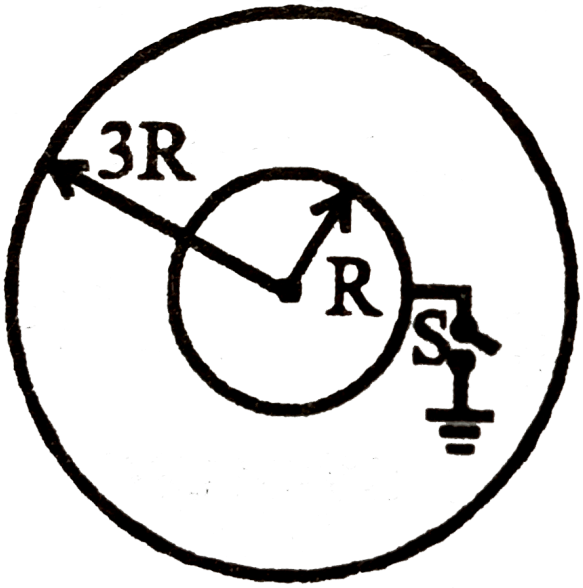
C. emf of the battery is 30 V

D. potential difference across the $12\mu F$ capacitor is 10 V

Answer: B::C::D

Watch Video Solution

19. Two thin conducting shells of radii R and $3R$ are as shown in the fig. External shell carries a charge $+Q$ and inner shell neutral. The inner shell is earthed with the help of a switch S. Then



A. When the switch S is open, the potential of the inner sphere is equal to that of the outer

B. When the switch S is closed, the potential of the inner sphere becomes zero

C. When the switch S is closed, the charge attained by the inner sphere is $-Q/3$

D. By closing the switch the capacitance of the system increases.

Answer: A::B::C::D

Watch Video Solution

20. A parallel-plate capacitor is connected to a cell. Its positive plate A and its negative plate B have charges $+Q$ and $-Q$ respectively. A third plate C, identical to A and B, with charge $+Q$, is now introduced midway between A and B, parallel to them. Which of the following are correct?

A. The charge on the inner face of B is now $-\frac{3Q}{2}$

B. There is no change in the potential difference between A and B

C. The potential difference between A and C is one-third of the potential difference between B and C

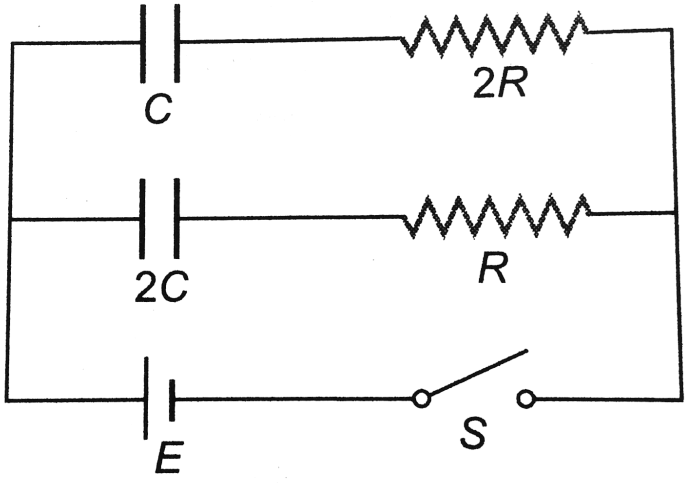
D. The charge on the inner face to A is now Q/2

Answer: A::B::C::D

Watch Video Solution

21. In the circuit shown in the figure, switch S is closed at time $t = 0$.

Select the correct statements.



A. Rate of increase of charge is same in both the capacitors

B. Ratio of charge stored in capacitors C and 2C at time t would be $1:2$

C. Time constant of both the capacitors are equal

D. Steady state charge in capacitors C and 2C are the ratio of $1:2$

Answer: B::C::D

Watch Video Solution

22. A capacitance C is connected to two equal resistance as shown in the figure. Then

A. at the time of charging of capacitor time constant the circuit is 2CR

B. at the time of discharging of capacitor time constant of the circuit is CR

C. at the time of discharging of the capacitor the time constant of the circuit is 2CR

D. at the time of charging of capacitor the time constant of the circuit is CR

Answer: C::D

Watch Video Solution

23. A metal sphere is electrically charged to Q_0 and hangs on an insulting cord. The sphere slowly loses it charge because the air has a non zero resistivity ρ. The potential of sphere of radius r_0 is to be calculated with reference to infinity. Assume that resistivity of air is every where the same. Mark the correct statements

A. Capacitance of sphere is $4\pi\varepsilon_0 r_0$

B. Electrical resistance of air is $R = \frac{\rho}{4\pi r_0}$

C. Initial current is $\frac{Q_0}{\rho\varepsilon_0}$

D. Time in which charge gets halved is $\rho\varepsilon_0 \ln 2$

Answer: A::B::C::D

Watch Video Solution

24. A parallel plate capacitor of area $100cm^2$ and plate separation 8.85 mm is charged to a potential difference of 100 V when air is used between the plates. The capacitor is now isolated and air is replaced by glass $(\varepsilon_r - 5)$, then:

A. The original capacity will be 10 pF

B. The new capacity will be 50 pF

C. The new potential difference is 200 V

D. The new energy stored is 50 μJ

Answer: A::B

Watch Video Solution

25. Consider two concentric metalic shell's of radii R and 2R. The inner shell is having charge Q and outer shell is uncharged. If they are connected with a conducting wire. Then,

A. Q amount of change will flow from inner to outer shell

B. Q/e number of electrons will flow from outer to inner shell, where 'e' is the charge on an electron

C. $\frac{KQ^2}{4R}$ amount of heat is produced in the process

D. $\frac{KQ^2}{2R}$ amount of heat is produced in the process

Answer: A::B::C

Watch Video Solution

26. A particle of mass 2 kg chrge 1 mC is projected vertially with velocity k $10ms^{-1}$. There is as uniform horizontal electric field of $10^4 N/C$, then

A. the horizontal range of the particle is 10 m

B. the time of the particle is 2 s

C. the maximum height reached is 5 m

D. the hoizontal range of the particle is 0

Answer: A::B::C

Watch Video Solution

27. In the given ciruit diagram, initial charge on capacitor is zero. Choose the correct option (s):

A. Current through battery just after closing of switch is 12 A

B. Current through capacitor just after closing of switch is 8 A

C. In steady state current through battery is 9 A

D. In steady state current through 6Ω resistance is 4.5 A

Answer: A::B::C::D

Watch Video Solution

28. Graph shows magnitude of electric field (E), charge enclosed $\left(q_{enclosed\rangle}\right)$ within the concentic sphere and net flux (ϕ) through a concentric spherical Gaussian surface as a function of distance (r) from

centre of a uniformly positive charged solid sphere of radius R. Choose the correct option (s):

A. 

B. 

C. 

D. 

Answer: B::C

Watch Video Solution

29. Two capacitors C_1 and C_2 are charged to same potential V, but with opposite polarity as shown in the figure. The switches S_1 and S_2 are then closed

A. Potential difference across two capacitors are same and is given by

$$\frac{(C_1 - C_2)V}{C_1 + C_2}$$

B. Potential difference across two capacitors are same and is given by

$$\left(\frac{C_1 + C_2}{C_1 - C_2}\right)V$$

C. Ratio of final energy to initial energy of the system is given by

$$\frac{(C_1 - C_2)^2}{(C_1 + C_2)^2}$$

D. Ratio of final energy to initial energy of the system is given by

$$\frac{(C_1)^2}{(C_1 + C_2)^2}$$

Answer: A::C

Watch Video Solution

30. Figure shows an arragement of four identical rectangular plates A, B, C and D each of area S.Thickness of plates is negligible. Then :

A. Potential difference between plates A and B is independent of Q_1

B. Potential difference between plates C and D is independent of Q_1

C. Potential difference between plates A and B is independent of Q_2

D. Potential difference between plates C and D is indpendent of Q_2

Answer: A::B

Watch Video Solution

31. A uniform electric field of $400V/m$ is directed at 45° to the positive X-axis, in the $X-Y$ plane as shown in figure

A. If the coordinates of two points A and B be (4 cm , 0) and $(-3cm, 0)$, then the potential difference $V_A - V_B$ will be 30.3 V

B. If the coordinates of two points A and B be (4 cm, 0) and $(3cm, 0)$, then the potential difference $V_A - V_B$ will be 4.3 V

C. The electric field could be due to infinite thin sheet of charge

D. The electric field could be in a spherical cavity of a uniformly charged sphere

Answer: A::B::C::D

Watch Video Solution

32. I a uniformly positively charged sphere a very thin tunnel has been made along the diameter as shown in the figure below. A carged particle - q having mass m is released from rest at one end of tunnel. For the situation described, mark out the correct statement (s) : [Neglect gravity]

A. Charged particle will perform SHM about centre of the sphere as mean position

B. Time period of the particle is $2\pi\sqrt{\frac{4\pi\varepsilon_0 mR^3}{qQ}}$

C. Particle will perform oscillation but not SHM

D. Speed of the particle while crossing mean positon is $\sqrt{\frac{Qq}{4\pi\varepsilon_0 mR}}$

Answer: A::B::D

Watch Video Solution

33. A conducting sphere of radius b has a spherical cavity with its centre displaced by 'a' from centre of sphere O_1. A point charged q is placed at the centre of cavity O_2. Q charge is given to conducting sphere and charge q_0 is placed at P, a distance c from centre O_1. Further O_1, O_2 and P are collinear

A. Charge dispribution on inner surface of cavity is unifrom

B. Potential of conductor is $\left(\frac{q_0}{4\pi\varepsilon_0 c}+\frac{Q+q}{4\pi\varepsilon_0 b}\right)$

C. Charge distribution on outer surface of conducting sphere is non uniform

D. Charge distribution on outer surface of conducting sphere is uniform

Answer: A::B::C

Watch Video Solution

34. The figure shown a graph of current in a dicharge circuit of a capacitor through a resistor of resistar 10Ω. Choose the correct option (s)

A. The initial potential difference across the capacitor 100 Volts

B. The capacitance of the capacitor is $\frac{1}{10In2}F$

C. The total heat produced in the circuit is $\frac{1000}{In2}J$

D. The total heat produced in the cirucit is $\frac{500}{In2}J$

Answer: A::B::D

Watch Video Solution

35. In the shown figures (1) and (2), capacitors are in steady state. Charging batteries are removed a switches S_1 and S_2 are closed at time $t = 0$. The plot In I (I is the current in the resistor) against time t the resitors R_1 and R_2 are shown in the figure. Choose the correct option (s)

(1) 

A. If $\varepsilon_1 = 2\varepsilon_2$, R_1 must be equal to $2R_2$

B. If $R_1 = R_2$, C_1 must be less than C_2

C. If $C_1 = C_2$, R_1 must be less than R_2

D. R_1C_1 is equal to R_2C_2

Answer: A::B::C

Watch Video Solution

36. A capacitance balance is shown in figure. The balance has a weight attached on one side and capacitor that has a variable gap width on other side. Assume the upper plate of the capacitor has negligibles mass. When the potential difference between the plates is V_0, the attractive force between the plates balance the weight of the hanging mass, Then:

A. Equilibrium of weight is stable

B. Equilibrium of weight is unstable

C. Value of V_0 required to balance the weight is given by

$$V_0 = d\sqrt{\frac{2Mg}{es\pi_0 A}}$$

D. for a small displacement block of mass M executes simple harmonic motion

Answer: B::C

Watch Video Solution

37. Three concentric spherical shells of radius $a, 2a$ and $4a$ having positive charges Q_1, Q_2 and Q_3 respectively are placed as shown. Now, shell of radius 'a' and '4a' are earthed through switch S_1 and S_2. A point 'P' lies at a distance 5a from the centre and a point R inside the inner most shell. Now, choose the correct option (s) when switch S_1 and S_2 are closed.

A. a. The magnitude of electric field at 'P' and at 'R' is equal

B. b. The potential of inner most shell and outermost shell must be equal

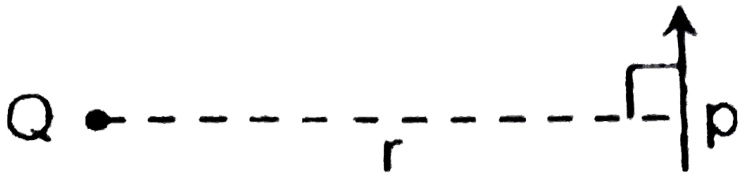
C. c. The magnitude of charge on shell of radius 2a remains unchanged

D. d. Potential must drop in moving from inner most shell to middle shell

Answer: A::B::C

Watch Video Solution

38.



A point charge $+Q$ is placed at a distance r from a short dipole of dipole moment $\overrightarrow{p}$ as shown in figure. The line joining the point charge Q to the centre dipole is perpendicular to dipole moment $\overrightarrow{p}$, which of the following statement are true?

A. The net electrostatic force on the dipole is zero

B. The electrostatic force on the dipole is $\frac{Qp}{4\pi\varepsilon_0 r^3}$ and is acting along the dipole moment p

C. Torque acting on the dipole is $\frac{Qp}{4\pi\varepsilon_0 r^2}$ in the inward direction

D. Torque acting on the dipole is $\frac{Qp}{2\pi\varepsilon_0 r^2}$ in the outward direction

Answer: B::C

 Watch Video Solution