PHYSICS

BOOKS - MTG GUIDE

ELECTROSTATICS

Illustration

1. $10^{12}\alpha$- particles (Nuclei of helium) per second falls on a neutral sphere, calculate time in which sphere gets charged by $2\mu C$.

Watch Video Solution

2. Electric force between two point charges q_1 and q_2 at rest is F. Now is a charge $-q_1$ is placed next to q_1. What will be the (a) force on q_2 due to q_1(b) total force on q_2 ?

Watch Video Solution

3. For the system shown in figure, find Q for which resultant force on q is zero.

View Text Solution

4. Two positive point charges $q_1 = 16\mu C$ and $q_2 = 4\mu C$ are separated in vacuum by a distance of $3.0m$. Find the point on the line between the charges where the net electric field is zero.-

Watch Video Solution

5. Two point masses, m each carrying charges $-q$ and $+q$ are attached to the ends of a massless rigid non - conducting wire of length L. When this arrangement is placed in a uniform electric field, then it deflects through an angle θ. The minimum time needed by the rod to align itself along the field is

Watch Video Solution

6. An electric dipole is placed at the centre of a sphere. Find the electric flux passing through the sphere.

Watch Video Solution

7. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q.

(a) A charge q is placed at the center of the shell. What is the surface charge density on the inner and outer surfaces of the shell ?

(b) Is the electric field intensity inside a cavity (with no charge) zero, even if the shell is not spherical, but has any irregular shape ? Explain.

Watch Video Solution

8. The electric potential at point A is $20V$ and at B is $-40V$. Find the work done by an external and electrostatic force in moving an electron slowly from B to A.

Watch Video Solution

9. A charge 'Q' is distributed over two concentric hollow spheres of radii 'r' and 'R' (gtr) such that the surface densities are equal. Find the potential at the common centre.

Watch Video Solution

Neet Cafe Topicwise Practice Questions

1. When a soap bubble is charged :-

A. it contracts

B. it expands

C. its size remains the same

D. it expands or contracts depending upon whether the charge is positive or negative

Answer: B

Watch Video Solution

2. If a charge -150 nC is given to a concentric spherical shell and a charge $+50$ nC is placed at its centre then the charge on inner and outer surface of the shell is

A. $-50nC, \ -100nC$

B. $+50, nC, \ -200nC$

C. $-50nC, \ -200nC$

D. 50 nC, 100 nC

Answer: A

Watch Video Solution

Watch Video Solution

3. Two identical spheres carrying charges $-9\mu C$ and $5\mu C$ respectively are kept in contact and then separated from each other. Point out true statement from the following. In each sphere

A. 1.25×10^{13} electrons are in deficit

B. 1.25×10^{13} electrons are in excess

C. 2.15×10^{13} electrons are in excess

D. 2.15×10^{13} electrons are in deficit

Answer: B

Watch Video Solution

4. A conductor has been given a charge $-3 \times 10^{-7} C$ by transferring electron. Mass increase (in kg) of the conductor and the number of electrons added to the conductor are respectively

A. 2×10^{-16} and 2×10^{31}

B. 2×10^{-31} and 2×10^{19}

C. 2×10^{-19} and 2×10^{16}

D. 2×10^{-18} and 2×10^{12}

Answer: D

Watch Video Solution

5. v36.3

A. $\frac{r}{\sqrt{K}}$

B. $\frac{r}{K}$

C. rK

D. $r\sqrt{K}$

Answer: A

Watch Video Solution

6. Force between two identical charges placed at a distance of r in vacuum is F.Now a slab of dielectric constant 4 is inserted between these two charges . If the thickness of the slab is $r/2$, then the force between the charges will becomes

A. F/4

B. F/2

C. 3F/5

D. 4F/9

Answer: D

Watch Video Solution

7. Coulomb's law for the force between electric charges most closely resembles with

A. law of conservation of energy

B. Newton's law of gravitation

C. Newton's 2^{nd} law of motion

D. law of conservation of charge

Answer: B

Watch Video Solution

8. Two particles , each of mass m and carrying charge Q , are separated by some distance. If they are in equilibrium under mutual gravitational and electrostatic force then $Q/m(\in C/kg)$ is of the order of

A. 10^{-5}

B. 10^{-10}

C. 10^{-15}

D. 10^{-20}

Answer: B

Watch Video Solution

9. The excess (equal to number) number of electrons that must be placed on each of two small spheres spaced $3cm$ apart with force of repulsion between the spheres of be $10^{-19}N$ is

A. 25

B. 225

C. 625

D. 1250

Answer: C

Watch Video Solution

10. If "$q_1 + q_2 = q$" ,then the value of the ratio "$\frac{q_1}{q}$" ,for which the force between q_1 and "q_2" is maximum is

A. 0.25

B. 0.75

C. 1

D. 0.5

Answer: D

Watch Video Solution

11. Under the action of a given coulombic force the acceleration of an electron is $2.5 \times 10^{22} ms^{-1}$. Then, the magnitude of the acceleration of a proton under the action of same force is nearly

A. $1.6 \times 10^{-19} ms^{-2}$

B. $9.1 \times 10^{31} ms^{-2}$

C. $1.5 \times 10^{19} ms^{-2}$

D. $1.6 \times 10^{27} ms^{-2}$

Answer: C

Watch Video Solution

12. Two identical charged spheres suspended from a common point by two mass-less strings of length l are initially at a distance d ($d < < l$) apart because of their mutual repulsion . The charge begins to leak from both the spheres at a constant rate. As a result the charge approach each other with a velocity v. Then as a function of distance x between them .

A. $v \propto x^{-1/2}$

B. $v \propto x^{-1}$

C. $v \propto x^{1/2}$

D. $v \propto x$

Answer: A

Watch Video Solution

13. Two spherical conductors B and C having equal radii and cayying equal charges on them repel each other with a force F when kept apart at some distance. A third spherical conductor having same radius as that B but uncharged is brought in contact with B, then brought in contact with C and finally removed away from both. The new force of repulsion between B and C is

A. $\frac{F}{4}$

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

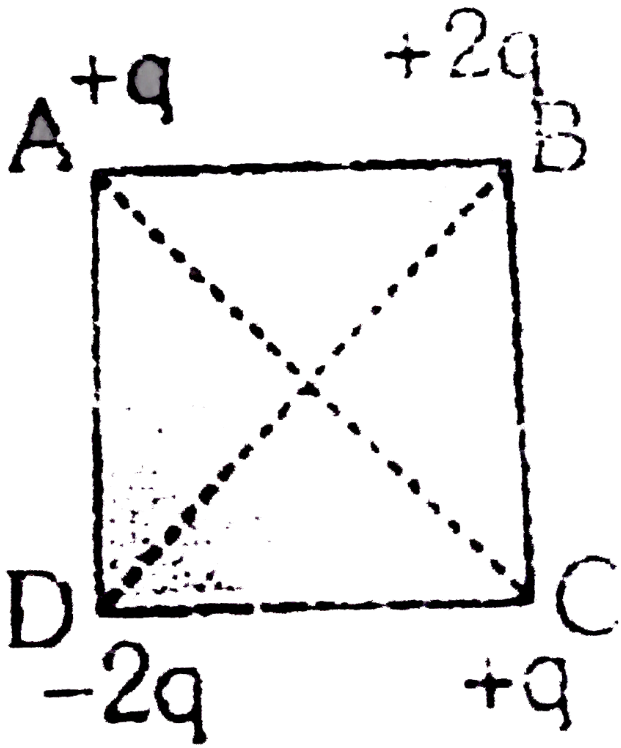
C. $\frac{F}{8}$

D. $\frac{3F}{8}$

Answer: D

Watch Video Solution

14. Four charges are arranged at the corners of a square ABCD as shown in the figure. The force on the charge kept at the centre O will be:



A. Zero

B. along the diagonal AC

C. along the diagonal BD

D. perpendicular to side AB

Answer: C

Watch Video Solution

15. In the basic CsCl crystal structure, Cs^{+} and Cl^{-} is ions are arranged in a bcc configuration as shown in the figure. The net electrostatic force exerted by the eight Cs^{+} ions on the Cl^{-} ions is

A. $\frac{1}{4\pi\varepsilon_0}\frac{4e^2}{3a^2}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{16e^2}{3a^2}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{32e^2}{3a^2}$

D. Zero

Answer: D

View Text Solution

16. Four charges are arranged at the corners of a square ABCD as shown in the figure. The force on the charge kept at the centre O is

A. along the diagonal BD

B. along the diagonal AC

C. Zero

D. perpendicular to side AB

Answer: D

View Text Solution

17. There are two charged identical metal spheres A and B repel each other with a force $3 \times 10^{-5} N$. Another identical uncharged sphere C is touched with A and then placed at the mid-point between A and B. Net force on C is

A. $1 \times 10^{-5} N$

B. $2 \times 10^{-5} N$

C. $1.5 \times 10^{-5} N$

D. $3 \times 10^{-5} N$

Answer: D

Watch Video Solution

18. A charge Q is place at each of the opposite corners of a square. A charge q is placed at each of the other two corners. If the net electrical force on Q is zero, then Q/q equals:

A. $Q=\sqrt{2}q$

B. $Q=-2\sqrt{2}q$

C. $Q=-\sqrt{2}q$

D. $Q = 2\sqrt{2}q$

Answer: B

Watch Video Solution

19. Two points +ve charges q each are placed at (-a, 0) and (a,0), A third +ve charge q_0 is placed at (0, y). Find the value of y for which the force at q_0 is maximum.

A. $\frac{a}{\sqrt{3}}$

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

C. a

D. 2a

Answer: B

View Text Solution

20. Three concentric metallic spherical shells of radii R, 2R, 3R are given charges $Q_1 Q_2 Q_3$, respectively. It is found that the surface charge densities on the outer surface of the shells are equal. Then, the ratio of the charges given to the shells $Q_1 : Q_2 : Q_3$ is

A. $1 : 2 : 3$

B. $1 : 3 : 5$

C. $1 : 4 : 9$

D. $1 : 8 : 18$

Answer: B

Watch Video Solution

21. A spherical conducting shell of inner radius R_1 and outer radius R_2 has charge Q. Now a charge q is placed inside the shell but not at centre then surface charge densities with their nature on inner and outer surfaces of shell are respectively.

A. $\frac{q}{4\pi r_1^2}$ and $\frac{Q}{4\pi r_2^2}$

B. $\frac{-q}{4\pi r_1^2}$ and $\frac{Q+q}{4\pi r_2^2}$

C. $\frac{q}{4\pi r_1^2}$ and $\frac{Q-q}{4\pi r_2^2}$

D. 0 and $\frac{Q-q}{4\pi r_2^2}$

Answer: C

Watch Video Solution

22. A sphere has surface charge density σ. It is surrounded by a spherical shell. The surface charge density on the spherical shell is

A. σ

B. $-\sigma$

C. zero

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

Answer: C

Watch Video Solution

23. An electron of mass m_e initially at rest moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p also initially at rest takes time t_2 to move through an equal distance in this uniform electric field.Neglecting the effect of gravity, the ratio of t_2 / t_1 is nearly equal to

A. $\left(\frac{m_p}{m_e}\right)^{1/2}$

B. $\left(\frac{m_e}{m_p}\right)^{1/2}$

C. 1

D. 1836

Answer: A

Watch Video Solution

24. In the uniform electric field of $E = 1 \times 10^4 NC^{-1}$, an electron is accelerated from rest. The velocity of the electron when it has travelled a distance of 2×10^{-2} m is nearly

$(\frac{e}{m}$ of electron $= 1.8 \times 10^{11} Ckg^{-1})$

A. $1.6 \times 10^{6} ms^{-1}$

B. $0.85 \times 10^{6} ms^{-1}$

C. $0.425 \times 10^{6} ms^{-1}$

D. $8.5 \times 10^{6} ms^{-1}$

Answer: D

Watch Video Solution

25. A charged oil drop is suspended in a uniform filed of $3 \times 10^{4} v / m$ so that it neither falls nor rises. The charge on the drop will be (Take the mass of the charge $= 9.9 \times 10^{-15} kg$ and $g = 10 m / s^{2}$)

A. $3.3 \times 10^{-18} C$

B. $3.2 \times 10^{-18} C$

C. $1.6 \times 10^{-18} C$

D. $4.8 \times 10^{-18} C$

Answer: A

Watch Video Solution

26. A small element l cut from a circular ring of radius a and λ charge per unit length. The net electric field at the centre of ring is

A. $\dfrac{\lambda}{2\pi\varepsilon_0 a^2}$

B. $\dfrac{\lambda}{4\pi\varepsilon_0 a^2}$

C. $\dfrac{\lambda^2}{2\pi\varepsilon_0 a^2}$

D. $\dfrac{\lambda}{2\pi\varepsilon_0 a}$

Answer: D

Watch Video Solution

27. There is a uniform electric field of strength $10^3 V/m$ along y-axis. A body of mass $1g$ and charge $10^{-6} C$ is projected into the field from origin along the positive x-axis with a velocity $10m/s$. Its speed in m/s after $10s$ is (Neglect gravitation)

A. 10

B. $5\sqrt{2}$

C. $10\sqrt{2}$

D. 20

Answer: C

Watch Video Solution

28. A charged particle of mass m and charge q is released from rest in an electric field of constant magnitude E. The kinetic energy of the particle after time t is

A. $\frac{E^2q^2t^2}{2m}$

B. $\frac{2E^2t^2}{mq}$

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

D. $\frac{Eq^2m}{2t^2}$

Answer: A

Watch Video Solution

29. A rod lies along the x-axis with one end at the origin and the other at $x \to \infty$. It carries a uniform charge λ C/m. The electric field at the point x = -a on the axis will be

A. $\overrightarrow{E} = \frac{\lambda}{4\pi\varepsilon_0 a}(-\hat{i})$

B. $\overrightarrow{E} = \frac{\lambda}{4\pi\varepsilon_0 a}(\hat{i})$

C. $\overrightarrow{E} = \frac{\lambda}{2\pi\varepsilon_0 a}(-\hat{i})$

D. $E = \frac{\lambda}{2\pi\varepsilon_0 a}(\hat{i})$

Answer: A

View Text Solution

30. A particle of mass 6.4×10^{-27} kg and charge $3.2 \times 10^{-19} C$ is situated in a uniform electric field of $1.6 \times 10^{5} Vm^{-1}$. The velocity of the particle at the end of 2×10^{-2}m path when it starts from rest is :

A. $2\sqrt{3} \times 10^{5} ms^{-1}$

B. $8 \times 10^{5} ms^{-1}$

C. $16 \times 10^{5} ms^{-1}$

D. $4\sqrt{2} \times 10^{5} ms^{-1}$

Answer: D

Watch Video Solution

31. A charged oil drop of mass $9.75 \times 10^{-15} kg$ and charge $30 \times 10^{-16} C$ is suspended in a uniform electric field existing between two parallel plates. The field between the plates is (take $g = 10 ms^{-2}$)

A. $3.25 Vm^{-1}$

B. $300 Vm^{-1}$

C. $325 Vm^{-1}$

D. $32.5Vm^{-1}$

Answer: D

View Text Solution

32. A negatively charged oil drop is prevented from falling under gravity by applying a vertical electric field $100Vm^{-1}$. If the mass of the drop is $1.6 \times 10^{-3}g$, the number of electrons carried by the drop is $(g = 10ms^{-2})$

A. 10^{18}

B. 10^{15}

C. 10^{12}

D. 10^{9}

Answer: C

View Text Solution

33. An electron initially at rest falls a distance of 1.5 cm in a uniform electric field of magnitude $2 \times 10^4 N/C$. The time taken by the electron to fall this distance is

A. $1.3 \times 10^2 s$

B. $2.1 \times 10^{-12} s$

C. $1.6 \times 10^{-10} s$

D. $2.9 \times 10^{-9} s$

Answer: D

Watch Video Solution

34. A charged drop of mass $3.2 \times 10^{-12} g$ floats between two horizontal parallel plates maintained at potential difference of 980 V and separation between the plates is 2 cm. The number of excess or deficient electrons on the drop is

A. 2

B. 4

C. 8

D. 16

Answer: B

Watch Video Solution

35. The spatial distribution of the electric field due to charges (A, B) is shown in figure.

Which one of the following statements is correct ?

A. A is +ve and B is -ve , $|A| > |B|$

B. A is -ve and B is +ve , $|A| = |B|$

C. Both are +ve but $A > B$

D. Both are -ve but $A > B$

Answer: A

View Text Solution

36. The direction of the electric field intensity due to an electric dipole at a point on its axis is the same as the direction of _____

A. along the equatorial line towards the dipole

B. along the equatorial line away from the dipole

C. perpendicular to the equatorial line and opposite to $\overrightarrow{p}$

D. perpendicular to the equatorial line and parallel to $\overrightarrow{p}$

Answer: C

Watch Video Solution

37. A neutral water molecule (H_2O) in its vapour state has an electric dipole moment of magnitudes $6.4 \times 10^{-30} C - m$. How far apart are the molecules centres of positive and negative charge

A. 4×10^{-10}

B. 4×10^{-11}

C. 4×10^{-12}

D. 4×10^{-13}

Answer: B

Watch Video Solution

38. A point dipole is located at the origin in some orientation. The electric field at the point (10 cm, 10 cm) on the x-y plane is measured to have a magnitude $1.0 \times 10^{-3} V/m$. What will be the magnitude of the electric field at the point (20 cm, 20 cm)?

A. $5.0 \times 10^{-4} V / m$

B. $2.5 \times 10^{-4} V / m$

C. It will depend on the orientation of the dipole.

D. $1.25 \times 10^{-4} V / m$

Answer: D

View Text Solution

39. Consider the following statements about electric dipole and select the correct ones.

S_1: Electric dipole moment vector $\overrightarrow{p}$ is directed from the negative charge to the positive charge

S_2: The electric field of a dipole potential falls off as $\frac{1}{r^2}$ and not as $\frac{1}{r}$

S_3: The electric field of a dipole at a point with position vector $\overrightarrow{r}$ depends on $\left|\overrightarrow{r}\right|$ as well as s angle between $\overrightarrow{r}$ and $\overrightarrow{p}$

S_4: In a uniform electric field, the electric dipole experience no net force but a torque

A. S2, S3 and S4

B. S3 and S4

C. S2 and S3

D. all four

Answer: D

Watch Video Solution

40. An electric dipole is placed at an angle of 30° with an electric field intensity $2 \times 10^5 N/C$. It experiences a torque equal to

$4Nm$. The charge on the dipole, if the dipole is length is $2cm$, is

A. 8 mC

B. 4mC

C. 6mC

D. 2mC

Answer: D

Watch Video Solution

41. An electric dipole consists of two opposite charges each $0.05 \mu C$ separated by 30 mm. The dipole is placed in an uniform external electric field of $10^6 NC^{-1}$. The maximum torque exerted by the field on the dipole is

A. $6 \times 10^3 Nm$

B. $3 \times 10^{-3} Nm$

C. $15 \times 10^{-3} Nm$

D. $1.5 \times 10^{-3} Nm$

Answer: D

Watch Video Solution

42. An electric dipole is placed in an uniform electric field with the dipole axis making an angle θ with the direction of the electric field. The orientation of the dipole for stable equilibrium is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

C. 0

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

Answer: C

Watch Video Solution

43. In a region of space, the electric field is given by $\overrightarrow{E} = 8\hat{i} + 4\hat{j} + 3\hat{k}$. The electric flux through a surface of area 100 units in the xy plane is

A. 800 units

B. 300 units

C. 400 units

D. 1500 units

Answer: B

Watch Video Solution

44. Consider a uniform electric field $E = 3 \times 10^3 \hat{i} N/C$. (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane ? (b)

What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis ?

A. $10NC^{-1}m^2$

B. $20NC^{-1}m^2$

C. $30NC^{-1}m^2$

D. $40NC^{-1}m^2$

Answer: C

Watch Video Solution

45. Consider a uniform electric field $E = 3 \times 10^3 \hat{i} N/C$. (a) What is the flux of this field through a square of 10 cm on a side whose plane is parallel to the yz plane ? (b) What is the flux through the same square if the normal to its plane makes a 60° angle with the x-axis ?

A. $10NC^{-1}m^2$

B. $15NC^{-1}m^2$

C. $20NC^{-1}m^2$

D. $25NC^{-1}m^2$

Answer: B

Watch Video Solution

46. The electric field in a region is given by $E = a\hat{i} + b\hat{j}$. Hence as and b are constants. Find the net flux passing through a square area of side I parallel to y-z plane.

A. a^2l^2

B. al^2

C. b^2l^2

D. bl^2

Answer: B

Watch Video Solution

47. Consider an electric field $\overrightarrow{E} = E_0 \widehat{x}$, where E_0 is a constant. The flux through the shaded area (as shown in the figure) due to this field is

A. $2E_0a^2$

B. $\sqrt{2}E_0a^2$

C. E_0a^2

D. $\dfrac{E_0a^2}{\sqrt{2}}$

Answer: C

View Text Solution

48. Two infinite plane parallel sheets, separated by a distance d have equal and opposite uniform charge densities σ. Electric field at a point between the sheets is

A. depends upon location of the point

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

C. $\frac{\sigma}{\varepsilon_0}$

D. zero

Answer: C

Watch Video Solution

49. A charge Q μc is placed at the centre of cube, the flux coming out from any surfaces will be : -

A. $\frac{Q}{6\varepsilon_0} \times 10^{-6}$

B. $\frac{Q}{6\varepsilon_0} \times 10^{-3}$

C. $\frac{Q}{24\varepsilon_0}$

D. $\frac{Q}{8\varepsilon_0}$

Answer: A

Watch Video Solution

50. According to Guss's theorem in CGS system, the total electric flux linked with a closed surface is equal to ________ times the total charge lying within the surface . [Fill in the blank]

A. the positive charge enclosed within the surface

B. $1/\varepsilon_0$ times the net charge outsied the surface

C. $1/\varepsilon_0$ times the total charge enclosed within the surface

D. the charge density on the surface

Answer: C

Watch Video Solution

51. Two parallel infinite line charges $+\lambda$ and $-\lambda$ are placed with a separation distance R in free space. The net electric field exactly mid-way between the two line charges is

A. zero

B. $\frac{2\lambda}{\pi\varepsilon_0 R}$

C. $\frac{\lambda}{\pi\varepsilon_0 R}$

D. $\frac{\lambda}{2\pi\varepsilon_0 R}$

Answer: B

Watch Video Solution

52. Eight dipoles of charges of magnitude e are placed inside a cube. The total electric flux coming out of the cube will be

A. $\frac{8e}{\varepsilon_0}$

B. $\frac{16e}{\varepsilon_0}$

C. $\frac{e}{\varepsilon_0}$

D. zero

Answer: D

Watch Video Solution

53. A point charge causes an electric flux of $-1.0 \times 10^3 Nm^2 / C$ to pass through a spherical Gaussian surface of 10.0 cm radius centred on the charge. (a) If the radius of the Gaussian surface were doubled, how much flux would pass through the surface ? (b) What is the is the value of the point charge ?

A. $-1.0 \times 10^{3} Nm^{2} / C$

B. $-2.0 \times 10^{3} Nm^{2} / C$

C. $-3.0 \times 10^{3} Nm^{2} / C$

D. $-4.0 \times 10^{3} Nm^{2} / C$

Answer: A

Watch Video Solution

54. A point charge q is placed at a distance $a/2$ directly above the centre of a square of side a. The electric flux through the square is

A. $\frac{Qd^2}{6\varepsilon_0}$

B. $\frac{Qd}{6\varepsilon_0}$

C. $\frac{Q}{6\varepsilon_0}$

D. $\frac{6Q}{\varepsilon_0}$

Answer: C

Watch Video Solution

55. A sphere of radius R has a uniform distribution of electric charge in its volume. At a distance x from its centre, for $x < R$, the electric field is directly proportional to

A. $E \propto r^{-2}$

B. $E \propto r^{-1}$

C. $E \propto r$

D. $E \propto r^{2}$

Answer: C

Watch Video Solution

56. Three infinitely long charge sheets are placed as shown in figure. The electric field at point P is

A. $\frac{2\sigma}{\varepsilon_0}\hat{k}$

B. $-\frac{2\sigma}{\varepsilon_0}\hat{k}$

C. $\frac{4\sigma}{\varepsilon_0}\hat{k}$

D. $-\frac{4\sigma}{\varepsilon_0}\hat{k}$

Answer: B

View Text Solution

57. Assuming that a positive charge Q is uniformly distributed over the surface of a shell, the field at a distane r from the centre of the shell where r = 3R (R being the radius of the shell), is

A. $\frac{Q}{\varepsilon_0 r\pi(2R)^2}$

B. $\frac{Q}{\varepsilon_0 r\pi R^2}$

C. $\dfrac{Q}{\varepsilon_0 r\pi(3R)^2}$

D. none of these

Answer: C

Watch Video Solution

58. The adjoining figure shows a spherical Gaussian surface and a charge distribution. When calculating the flux of electric field through the Graussian surface, the electric field will be due to

A. $+q_3$ alone

B. $+q_1$ and $+q_3$

C. $+q_q, \; -q_2$ and $+q_3$

D. $+q_1$ and $-q_2$

Answer: C

View Text Solution

59. Let there be a spherically symmetric charge distribution with charge density varying as $\rho(r) = \rho\left(\frac{5}{4} - \frac{r}{R}\right)$ upto $r = R,$ and $\rho(r) = 0$ for $r > R,$ where r is the distance from the origin. The electric field at a distance r(rltR) from the origin is given by

A. $\frac{\rho_0 r}{3\varepsilon_0}\left(\frac{5}{4} - \frac{r}{R}\right)$

B. $\frac{4\pi\rho_0 r}{3\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$

C. $\frac{\rho_0 r}{4\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$

D. $\frac{4\rho_0 r}{3\varepsilon_0}\left(\frac{5}{4} - \frac{r}{R}\right)$

Answer: C

Watch Video Solution

60. What is the electric flux linked with closed surface?

A. $10^{11} Nm^2 C^{-1}$

B. $10^{12} Nm^2 C^{-1}$

C. $10^{10} Nm^2 C^{-1}$

D. $8.86 \times 10^{13} Nm^2 C^{-1}$

Answer: B

View Text Solution

61. Electric charge is uniformly distributed along a long straight wire of radius 1 mm. The charge per cm length of the wire Q coulomb. Another cylindrical surface of radius 50 cm and length 1 m symmetrical encloses the wire as shown in the figure. The total electric flux passing through the cylindrical surface is

A. $\frac{Q}{\varepsilon_0}$

B. $\frac{100Q}{\varepsilon_0}$

C. $\frac{10Q}{\pi\varepsilon_0}$

D. $\frac{100Q}{\pi\varepsilon_0}$

Answer: B

Watch Video Solution

62. The total electric flux emanating from a closed surface enclosing an alpha particale (e = electronic chage) is

A. $\frac{2e}{\varepsilon_0}$

B. $\frac{e}{\varepsilon_0}$

C. $\frac{\varepsilon_0 e}{4}$

D. $\frac{4e}{\varepsilon_0}$

Answer: A

Watch Video Solution

63. Gauss's law of electrostatics would be invalid if

A. there were magnetic monopoles

B. the speed of light was not a universal constant

C. the inverse square law was not exactly true

D. the electrical charge was not quantized

Answer: C

Watch Video Solution

64. Using Gauss' law, derive an expression for the electric field at a point near an infinitely long straight uniformly charged wire.

A. r

B. r^2

C. $\frac{1}{r}$

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

Answer: C

Watch Video Solution

65. A charge $10\mu C$ is placed at the centre of a hemisphere of radius R = 10 cm as shown. The electric flux through the hemisphere (in MKS units) is

A. 20×10^5

B. 10×10^5

C. 6×10^5

D. 2×10^5

Answer: C

View Text Solution

66. An electric charge of $8.85 \times 10^{-13} C$ is placed at the centre of a sphere of radius 1 m. The electric flux through the sphere is

A. $0.2 NC^{-1} m^2$

B. $0.1 NC^{-1} m^2$

C. $0.3 NC^{-1} m^2$

D. $0.01 NC^{-1} m^2$

Answer: B

Watch Video Solution

67. A charge 'Q' is distributed over two concentric hollow spheres of radii 'r' and 'R' (gtr) such that the surface densities are equal. Find the potential at the common centre.

A. $\dfrac{Q\left(R^2+r^2\right)}{4\pi\varepsilon_0(R+r)}$

B. $\dfrac{Q}{R+r}$

C. zero

D. $\dfrac{Q(R+r)}{4\pi\varepsilon_0(R^2+r^2)}$

Answer: D

Watch Video Solution

68. The electric potential at a point on the axis of an electric dipole depends on the distance r of the point from the dipole as

A. $\dfrac{p}{4\pi\varepsilon_0 r^3}$

B. $\dfrac{p}{4\pi\varepsilon_0 r^2}$

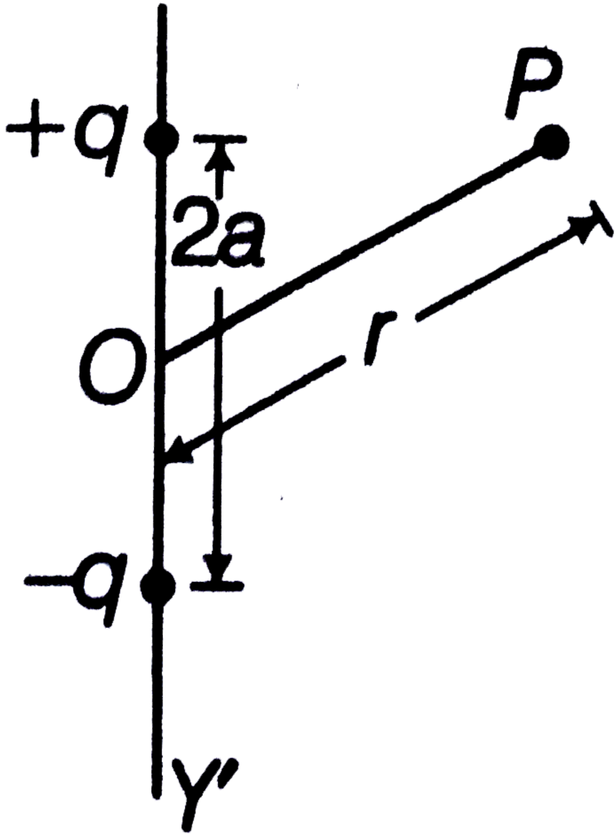
C. zero

D. $\dfrac{2p}{4\pi\varepsilon_0 r^3}$

Answer: C

Watch Video Solution

69. What is the electric potential at a point P, distance r from the mid-point of ann electric dipole of moment p(=2aq) ?



A. $V = \dfrac{p \cos \theta}{4\pi\varepsilon_0 r^2}$

B. $V = \dfrac{p \cos \theta}{4\pi\varepsilon_0 r}$

C. $V = \dfrac{p \sin \theta}{4\pi\varepsilon_0 r}$

D. $V = \frac{p \cos \theta}{4\pi\varepsilon_0 r^3}$

Answer: A

Watch Video Solution

70. 64 identical drops of mercury are charged simultaneously to the same potential of 10 volt. Assuming the drops to be spherical, if all the charged drops are made to combine to form one large drop, then its potential will be

A. 100 v

B. 320 V

C. 640 V

D. 160 V

Answer: D

Watch Video Solution

71. A cube of side b has a charge q at each of its vertices. Determine the potential and electric field due to this charge array at the center of the cube.

A. zero

B. $\dfrac{4q}{\sqrt{3}\pi\varepsilon_0 b}$

C. $\dfrac{q}{\pi\varepsilon_0 b}$

D. $\dfrac{4q}{\pi\varepsilon_0 b}$

Answer: B

Watch Video Solution

72. n small drops of same size are charged to V volts each .If they coalesce to from a single large drop, then its potential will be -

A. Vn

B. Vn^{-1}

C. $Vn^{1/3}$

D. $Vn^{2/3}$

Answer: D

Watch Video Solution

73. A charge configuration is shown in figure. What is the potential at a point P at a distance r on the axis, as shown assuming $r > > a$?

A. $\frac{q}{4\pi\varepsilon_0}\left(\frac{2a}{r^2}+\frac{1}{r}\right)$

B. $\frac{q}{4\pi\varepsilon_0}\left(\frac{2a}{r}+\frac{1}{r^2}\right)$

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

D. $\frac{q}{4\pi\varepsilon_0}\left(\frac{a}{r^2}+\frac{2}{r}\right)$

Answer: A

View Text Solution

74. A non conducting sphere of radius R is charged uniformly. At what distance from its surface is the electrostatic potential is half the potential at its centre ?

A. R

B. R/2

C. R/3

D. 2R

Answer: C

Watch Video Solution

Watch Video Solution

75. An electric charge $10^{-3}\mu C$ is placed at the origin (0, 0) of X-Y co-ordinate system. Two points A and B are situated at $(\sqrt{2}, \sqrt{2})$ and (2, 0) respectively. The potential difference between the points A and B will be

A. 4.5 volt

B. 9 volt

C. zero

D. 2 volt

Answer: C

Watch Video Solution

76. Two thin wire rings each having a radius R are placed at a distance d apart with their axes coiciding. The charges on the two rings are $+q$ and $-q$. The potential difference between the centres of the two rings is

A. $\frac{q}{4\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

B. zero

C. $\frac{q}{2\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

D. $\frac{qR}{4\pi\varepsilon_0 d^2}$

Answer: C

Watch Video Solution

77. Two conducting spheres of radii r_1 and r_2 are equally charged. The ratio of their potentral is-

A. $\frac{r_1}{r_2}$

B. $\frac{r_2^2}{r_1^2}$

C. $\frac{r_2}{r_1}$

D. $\frac{r_1^2}{r_2^2}$

Answer: C

Watch Video Solution

78. Find the potential difference between the points E and F in the figure given below. Assume E and F are the midpoints of AB and

DC respectively.

A. $(1.2 \times 10^9 q)$ volt

B. $(1.8 \times 10^9 q)$ volt

C. $(1.5 \times 10^9 q)$ volt

D. $(3 \times 10^9 q)$ volt

Answer: A

View Text Solution

79. Two conducting spheres of radii 3 cm and 1 cm are separated by a distance of 10 cm in free space. If the spheres are charged to same potential of 10 V each, then the force of repulsion between them is

A. $\left(\frac{1}{3}\right) \times 10^{-9} N$

B. $\left(\frac{2}{9}\right) \times 10^{-9} N$

C. $\left(\frac{1}{9}\right) \times 10^{-9} N$

D. $\left(\frac{4}{3}\right) \times 10^{-9} N$

Answer: A

Watch Video Solution

80. A charge $+q$ is fixed at each of the points $x = x_0, \ x = 3x_0, \ x = 5x_0, ... x = \infty$ on the x axis, and a charge $-q$ is fixed at each of the points $x = 2x_0, x = 4x_0, x = 6x_0,$ .... $x = \infty$. Here x_0 is a positive constant. Take the electric potential at a point due to a charge Q at a distance r from it to be $Q / (4\pi\varepsilon_0 r)$.Then, the potential at the origin due to the above system of

A. 0

B. $\dfrac{q}{8\pi\varepsilon_0 x_0 \ln 2}$

C. ∞

D. $\dfrac{q \ln 2}{4\pi\varepsilon_0 x_0}$

Answer: D

Watch Video Solution

81. A and B are two points on the axis and the perpendicular bisector of an electric dipole. A and B are far away from the dipole and at equal distances from it. The potentials at A and B are V_A and V_B respectively. Then

A. $V_A = V_B = 0$

B. $V_A = 2V_B$

C. $V_A \neq 0, V_B = 0$

D. $V_A \neq 0, V_B \neq 0$

Answer: C

Watch Video Solution

82. Two conducting concentric, hollow spheres A and B have radii a and b respectively, with A inside B. Their common potentials is V. A is now given some charge such that its potential becomes zero. The potential of B will now be

A. 0

B. $V\left(1-\frac{a}{b}\right)$

C. $\left(\frac{V}{ab}\right)$

D. $V\frac{(b-a)}{(b+a)}$

Answer: B

Watch Video Solution

83. Three concentric spherical metallic spheres A, B and C of radii a, b and $c(a < b < c)$ have surface charge densities $\sigma, -\sigma$ and σ respectively.

A. $V_A = (a+b+c)\dfrac{\sigma}{\varepsilon_0}$

B. $V_B = \left(\dfrac{a^2}{b} - b + c\right)\dfrac{\sigma}{\varepsilon_0}$

C. $V_C = \left(\dfrac{a^2+b^2}{c} + c\right)\dfrac{\sigma}{\varepsilon_0}$

D. $V_A = V_B = V_C = (a+b+c)\dfrac{\sigma}{\varepsilon_0}$

Answer: B

Watch Video Solution

84. Two identical thin ring, each of radius R meters, are coaxially placed a distance R metres apart. If Q_1 coulomb, and Q_2 coulomb, are repectively the charges uniformly spread on the two rings, the work done in moving a charge q from the centre of one ring to that of the other is

A. zero

B. $\dfrac{q\sqrt{2}}{4\pi\varepsilon_0 a}(Q_1 - Q_2)$

C. $\dfrac{q\left(\sqrt{2}-1\right)}{4\pi\varepsilon_0 a\sqrt{2}}(Q_1 - Q_2)$

D. $\dfrac{q\left(\sqrt{2}-1\right)}{4\pi\varepsilon_0 a}(Q_1 - Q_2)$

Answer: C

Watch Video Solution

85. Poistive and negative point charges of equal magnitude are kept at $\left(0, 0, \dfrac{a}{2}\right)$ and

$\left(0, 0, \frac{-a}{2}\right)$ respectively. The work done by the electric field when another poistive point charge is moved from $(-a, 0, 0)$ to $(0, a, 0)$ is

A. positive

B. negative

C. zero

D. depends on the path connecting the initial and final positions

Answer: C

Watch Video Solution

86. On moving a charge of 20 coulomb by 2cm, 2J of work is done, then the potential difference between the points is

A. 0.1 V

B. 8 V

C. 2 V

D. 0.5 V

Answer: A

Watch Video Solution

87. A hollow metal sphere of radius $5cm$ is charged so that the potential on its surface is $10V$. The potential at the centre of the sphere is

A. 0 V

B. 10 V

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

D. same as at a point 20 cm away from the surface

Answer: B

Watch Video Solution

88. If a linear isotropic dielectric is placed in an electric field of strength E, then the polarization P is

A. independent of E

B. inversely proportional to E

C. directly proportional to $\sqrt{E}$

D. directly proportional to E

Answer: D

Watch Video Solution

89. A sphere of 10 cm diameter is suspended within a hollow sphere of 12 cm diameter. If the inner sphere be charged to a potential of

15,000 V and the outer sphere be earthed, the charge on the inner sphere is

A. $5 \times 10^{-7} C$

B. $6 \times 10^{-7} C$

C. $7 \times 10^{-7} C$

D. $8 \times 10^{-7} C$

Answer: A

Watch Video Solution

90. N identical drops of mercury are charged simultaneously to 10 V. When combined to form one large drop, the potential is found to be 40 V, the value of N is:

A. 4

B. 6

C. 8

D. 10

Answer: D

Watch Video Solution

91. If n identical drops of mercury are combined to form a bigger drop then find the capacity of bigger drop, if capacity of each drop of mercury is C.

A. $n^{1/3}C$

B. $n^{2/3}C$

C. $n^{1/4}C$

D. nC

Answer: C

Watch Video Solution

92. A spherical capacitor has an inner sphere of radius 12 cm and an outer sphere of radius 13 cm. The outer sphere is earthed and the inner sphere is given a charge of $2.5\mu C$. The space between the concentric spheres is filled with a liquid of dielectric constant 32.

(a) Determine the capacitance of the capacitor.

(b) What is the potential of the inner sphere ?

(c) Compare the capacitance of this capacitor with that of an isolated sphere of radius 12 cm.Explain why the later is much smaller ?

A. $5.5 \times 10^{-9} F$

B. $6.5 \times 10^{-9} F$

C. $7.5 \times 10^{-9} F$

D. $8.5 \times 10^{-9} F$

Answer: A

Watch Video Solution

93. The magnitude of electric field $\vec{E}$ in the annular region of a charged cylindrical capacitor.

A. is the same throughout

B. is higher near the outer cylinder than near the inner cylinder

C. varies as $\frac{1}{r}$ where r is the distance from the axis

D. varies as $\frac{1}{r^2}$ where r is the distance from the axis

Answer: C

Watch Video Solution

94. A parallel plate capacitor of capacity $5\mu F$ and plate separation $6cm$ is connected to a $1V$ battery and is charged. A dielectric of dielectric constant 4 and thickness $4cm$ is introduced into the capacitor. The additional charge that flows into the capacitor from the battery is.

A. $2\mu C$

B. $3\mu C$

C. $5\mu C$

D. $10\mu C$

Answer: C

Watch Video Solution

95. Two metal plates form a parallel plate capacitor. The distance between the plates is d. A metal sheet of thickness d/2 and of the same area is indroduced between the plates. What is the ratio of the capacitances in the two cases?

A. $4:1$

B. $2:1$

C. $3:1$

D. $5:1$

Answer: B

Watch Video Solution

96. A parallel plate capacitor has an electric field of $10^5 V/m$ between the plates. If the charge on the capacitor plate is $1\mu C$, then force on each capacitor plate is-

A. 0.5 N

B. 0.005N

C. 0.05 N

D. 0.0005N

Answer: C

Watch Video Solution

97. In a parallel plate capacitor with plate area A and charge Q, the force on one plate because of the charge on the other is equal to

A. $\frac{Q^2}{\varepsilon_0 A^2}$

B. $\frac{Q^2}{2\varepsilon_0 A^2}$

C. $\frac{Q^2}{\varepsilon_0}$

D. $\frac{Q^2}{2\varepsilon_0 A}$

Answer: D

Watch Video Solution

98. A parallel plate condenser is charged by connected it to a battery. The battery is disconnected and a glass slab is introduced between the plates. Then

A. charge and potential difference

B. charge and capacitance

C. energy stored and potential difference

D. energy stored and capacitance

Answer: C

Watch Video Solution

99. The capacitance of a parallel plate capacitor with air as medium is $3\mu F$. with the introduction of a dielectric medium between the plates, the capacitance becomes $15\mu F$. The permittivity of the medium is

A. $5C^2N^{-1}m^{-2}$

B. $15C^2N^{-1}m^{-2}$

C. $0.44 \times 10^{-10}C^2N^{-1}m^{-2}$

D. $8.854 \times 10^{-11} C^2 N^{-1} m^{-2}$

Answer: C

Watch Video Solution

100. A slab of material of dielectric constant K has the same area as the plates of a parallel capacitor, but has a thickness $\left(\frac{3}{4}d\right)$, where d is the separation of the plates. How is the capacitance changed when the slab is inserted between the plates

A. $\frac{3K}{K+4}$

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

C. $\frac{4K}{K+3}$

D. $\frac{4}{3}K$

Answer: C

Watch Video Solution

101. Two infinitely long parallel conducting plates having surface charge densities $+\sigma$ and $-\sigma$ respectively, are seperated by a small distance. The medium between the plates is vacuum. If ε_0 is the dielectric permittivity of vacumm, then the electric field in the region between the plates is

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

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

C. 0

D. none of these

Answer: B

Watch Video Solution

102. In a parallel plate capacitor, if the intervening medium of permittivity ε between the plates is replaced by another medium of permitivity $\frac{\varepsilon}{2}$, then its capacitance is

A. halved

B. doubled

C. unchaned

D. quadrupled

Answer: A

Watch Video Solution

103. What is the equivalent capacitance between A and B in given figure ?

A. $\frac{1}{31}F$

B. $\frac{48}{13}F$

C. $\frac{10}{13}F$

D. $\frac{240}{71}F$

Answer: D

View Text Solution

104. The resultant capacitance between A and B is

A. $1\mu F$

B. $3\mu F$

C. $2\mu F$

D. $1.5\mu F$

Answer: A

View Text Solution

105. Four metallic plates, each with a surface area A, are placed at a distance d from each other. The alternating plates are connected to points A and B as shown in the figure. Then the capacitance of the system is

A. $\frac{\varepsilon_0 A}{d}$

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

C. $\frac{3\varepsilon_0 A}{d}$

D. $\frac{4\varepsilon_0 A}{d}$

Answer: C

View Text Solution

106. The following arrangement consists of five identical metal plates marked 1,2,3,4 and 5 parallel to each other. Area of each plate is A and separation between the successive plates is d. The capacitance between P and Q is

A. $5\frac{\varepsilon_0 A}{d}$

B. $\frac{7}{3}\frac{\varepsilon_0 A}{d}$

C. $\frac{5}{3}\frac{\varepsilon_0 A}{d}$

D. $\frac{4}{3}\frac{\varepsilon_0 A}{d}$

Answer: C

View Text Solution

107. Two capacitors A and B are connected in series with a battery as shown in figure. When the switch S is closed and the two capacitors get charged fully, then

A. the potential difference across the plates of A is 4V and across the plates of B is 6 V.

B. the potential difference across the plates of A is 6V and across the plates of B is 4 V.

C. the ratio of electrical energies stored in A and B is 2:3

D. the ratio of charges on A and B is 3:2.

Answer: B

View Text Solution

108. Figure shows four plates each of area A and separated from one anoter by a distance d what is the capacitance between P and Q ?

A. $\frac{\varepsilon_0 A}{d}$

B. $\dfrac{2\varepsilon_0 A}{d}$

C. $\dfrac{3\varepsilon_0 A}{d}$

D. $\dfrac{4\varepsilon_0 A}{d}$

Answer: B

View Text Solution

109. For the given circuit, the equivalent capacitance between points P and Q is

A. 6C

B. 4C

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

D. $\frac{6}{11}C$

Answer: D

View Text Solution

110. Four identical capacitors are connected in series with a 10 V battery as shown in the figure. Potentials at A and B are

A. 10 V, 0 V

B. 7.5 V, -2.5 V

C. 5V, -5V

D. 7.5 V, 2.5 V

Answer: B

View Text Solution

111. Seven capacitors, a switch S and s source of emf are connected as shown in the figure. Initially, S is open and all capacitors are uncharged. After S is closed and steady state is attained, the potential difference in volt across the plates of the capacitor A is

A. 12

B. 15

C. 17

D. 19

Answer: A

View Text Solution

112. A parallel plate capacitor with air between the plates has capacitance of $9pF$. The separation between its plates is 'd'. The space between the plates is now filled with two dielectrics. One of the dielectrics has dielectric constant $k_1 = 3$ and thickness $\frac{d}{3}$ while the other one has dielectric constant $k_2 = 6$ and thickness $\frac{2d}{3}$. Capacitance of the capacitor is now

A. 20.25 pF

B. 1.8 pF

C. 45 pF

D. 40.5 Pf

Answer: D

Watch Video Solution

113. In the circuit below, capacitors A and have identical geometry, but a material of dielectric constant 3 is present between the plates of B. The potentia difference across A and B are, respectively

A. 2.5 V, 0.5 V

B. 2V, 8V

C. 7.5 V, 2.5 V

D. 8V, 2V

Answer: C

View Text Solution

114. The equivalent capacitance between A and B in the following figure is $2\mu F$, what is capacitance of C ?

A. $\frac{32}{11}\mu F$

B. $\frac{11}{32}\mu F$

C. $\frac{7}{32}\mu F$

D. $\frac{32}{7}\mu F$

Answer: D

View Text Solution

115. Six equal capacitor each of capacitance C are connected as shown in figure. Then the equivalent capacitance between A and B is

A. 6C

B. charge and capacitance

C. 2C

D. C/2

Answer: C

View Text Solution

116. Figure shows three capacitors connected to a 6V power supply. What is the charge on the $2\mu F$ capacitor ?

A. $1\mu C$

B. $2\mu C$

C. $3\mu C$

D. $4\mu C$

Answer: B

View Text Solution

117. Two capacitors $A(2\mu F)$ and $B(5\mu F)$ are connected to two batteries as shown in the figure. Then the potential difference in volts between the plates of A is

A. 2

B. 5

C. 11

D. 18

Answer: B

View Text Solution

118. Two capacitors C_1 and C_2 are connected in a circuit as shown in figure. The potential difference $(V_A - V_B)$ is

A. 8V

B. $-12V$

C. $-8V$

D. 12V

Answer: C

View Text Solution

View Text Solution

119. Two parallel conducting plates of area $A = 2.5 m^2$ each are placed 6mm apart and are both earthed. A third plate, identical with the first two, is placed at a distance of 2 mm from one of the earthed plates and is given a charge of 1C. The potential of the central plate is

A. $6 \times 10^7 V$

B. $3 \times 10^7 V$

C. $4 \times 10^7 V$

D. $2 \times 10^7 V$

Answer: A

View Text Solution

120. A parallel plate capacitor of plate area A, separation d is filled with dielectrics as shown in the given figure. The dielectric constants are K_1 and K_2. Net capacitance is

A. $\frac{\varepsilon_0 A}{d}(K_1 + K_2)$

B. $\frac{\varepsilon_0 A}{d}\left(\frac{K_1 + K_2}{K_1 K_2}\right)$

C. $\frac{2\varepsilon_0 A}{d}\left(\frac{K_1 K_2}{K_1 + K_2}\right)$

D. $\frac{2\varepsilon_0 A}{d}\left(\frac{K_1 + K_2}{K_1 K_2}\right)$

Answer: C

View Text Solution

121. Two identical capacitors 1 and 2 are connected in series to a battery as shown in figure. Capacitor 2 contains a dielectric slab of constant K. Q_1 and Q_2 are the charges stored in 1 and 2. Now, the dielectric slab is removed and the corresponding charges are Q'_1 and Q'_2. Then

A. $\frac{Q'_1}{Q_1} = \frac{K+1}{K}$

B. $\frac{Q'_2}{Q_2} = \frac{K+1}{2}$

C. $\frac{Q'_2}{Q_2} = \frac{K+1}{2K}$

D. $\frac{Q'_1}{Q_1} = \frac{K}{2}$

Answer: C

View Text Solution

122. A network of six identical capacitors, each of value C, is made as shown in the figure. The equivalent capacitancce between the points A and B is

A. C/4

B. 3C/4

C. 3C/2

D. 4C/3

Answer: D

View Text Solution

123. Two capacitrors of $2\mu F$ and $4\mu F$ are connected in parallel. A third capacitor of $6\mu F$ is connected in series. The combaination is connected across a 12 V battery. The voltage across $2\mu F$ capacitor is

A. 2V

B. 8V

C. 6V

D. 1V

Answer: C

Watch Video Solution

124. A capacitor is made of a flat plate of area A and second plate having a stair like structure as shown in figure. The width of each stair is a and the height is B. The capacitance of the capacitor is

A. $\dfrac{2\varepsilon_0 A}{3(d+b)}$

B. $\dfrac{A\varepsilon_0\left(3d^2+6bd+2b^2\right)}{3d(d+b)(d+2b)}$

C. $\dfrac{A\varepsilon_0\left(d^2+2bd+b^2\right)}{3d(d+b)(d+2b)}$

D. $\dfrac{\varepsilon_0 A}{(d+a+b)}$

Answer: B

View Text Solution

125. Two air capacitors A and B having capacities 1 μF and $4 \mu F$ respectively are connected in series with a 35 V source. A medium of dielectric constant K=3 is introduced in between the plates of A. what is the change in the charge on the combined capacitor?

A. $32 \mu C$

B. $16 \mu C$

C. $60 \mu C$

D. $28\mu C$

Answer: A

Watch Video Solution

126. A 10 V battery is connected to three capacitors, $C_1 = 2\mu F$, $C_2 = 3\mu F$ and $C_3 = 5\mu F$, as shown in figure. The charges on the capacitors C_1, C_2 and C_3 respectively are,

A. $2\mu C, 3\mu C, 5\mu C$

B. $5\mu C, 10\mu C, 15\mu C$

C. $10\mu C, 15\mu C, 25\mu C$

D. $4\mu C, 6\mu C, 10\mu C$

Answer: C

View Text Solution

127. The charge on $4\mu F$ capacitor in the given circuit is

A. $12\mu C$

B. $24\mu C$

C. $36\mu C$

D. $32\mu C$

Answer: B

View Text Solution

128. In this diagram, the P.D. between A and B is 60 V. The P.D. across $6\mu F$ capacitor is

A. 10 V, 0 V

B. 5V

C. 20 V

D. 4V

Answer: A

View Text Solution

129. In the circuit shown in figure, a potential difference of 60 V is applied across AB. The potential difference between the points M and

N is.

A. 10 V

B. 15 V

C. 20V

D. 30 V

Answer: B

View Text Solution

130. The equivalent capacitance between points M and N as shown in the figure is

A. infinity

B. $C_1 + \frac{C_2}{C_1}$

C. $\frac{C_1 C_2}{C_1 + C_2}$

D. none of these

Answer: A

View Text Solution

131. Four capacitors and a battery are connected as shown in the figure. If the potential difference across the $7 \mu F$ capacitor is 6V, then which of the following statements is incorrect ?

A. The potential drop across the $12 \mu F$ capacitor is 10 V.

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

.

C. The potential drop across the $3\mu F$ capacitor is 10 V.

D. The emf of the battery is 30 V.

Answer: C

View Text Solution

132. A parallel plate air capacitor has a capacitance C. When it is half filled with a dielectric of dielectric constant 5, the percentage increase in the capacitance will be

A. 4

B. $66.6\ \%$

C. $33.3\ \%$

D. 2

Answer: B

Watch Video Solution

133. Five capacitors each of capacitance value C are connected as shown in the figure. The ratio of capacitance between P and R and the capacitance between P and Q is

A. $3:1$

B. $5:2$

C. $2:3$

D. $1:1$

Answer: C

View Text Solution

134. With reference to the arrangement of capacitors shown in the figure, the effective capacitance between points A and B is

A. $3\mu F$

B. $\frac{8}{3}\mu F$

C. $20\mu F$

D. $12\mu F$

Answer: A

View Text Solution

135. A network of six identical capacitors, each of value C is made as shown in the figure. Equivalent capacitance between points A and B is

A. $\frac{C}{4}$

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

C. $\frac{4C}{3}$

D. 3C

Answer: C

View Text Solution

136. The capacities of three capacitors are in the ratio of $1:2:3$. Their equivalent capacity in parallel is greater than their equivalent capacity in series by $60/11\ pF$. Calculate their individual capacitance.

A. 4,6,7

B. 1,2,3

C. 2,3,4

D. 1,3,6

Answer: B

Watch Video Solution

137. Two capacitors C_1 and $C_2 = 2C_1$ are connected in a circuit with a switch between them as shown in figure. Initially, the switch is open and C_1 holds charge Q. The switch is closed. At steady state, the charge on each capacitor would be

A. Q, 2Q

B. $\frac{Q}{3}, \frac{2Q}{3}$

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

D. $\frac{2Q}{3}, \frac{4Q}{3}$

Answer: B

View Text Solution

138. In the given figure, the equivalent capacitance between points A and B is

A. 1.5C

B. 2C

C. 3C

D. 6C

Answer: A

View Text Solution

139. In the given arrangement of capacitors, equivalent capacitance between points M and N is

A. $\frac{5}{4}C$

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

C. $\frac{4}{5}C$

D. $\frac{4}{3}C$

Answer: A

View Text Solution

140. Three capacitors are connected in the arms of a triangle ABC as shown in figure, 5V is applied between A and B. The voltage between B and C is

A. 2V

B. 1V

C. 3V

D. 1.5V

Answer: A

View Text Solution

141. The equivalent capacitance between A and B is (in μF)

A. 25

B. $\frac{84}{25}$

C. 1

D. $\frac{25}{84}$

Answer: C

View Text Solution

142. Four identical capacitors are connected as shown in diagram. When a battery of 6V is connected between A and B, the charge stored is found to be $1.5\mu C$. The value of C_1 is

A. $2.5\mu F$

B. $0.1\mu F$

C. $1.5\mu F$

D. $1\mu F$

Answer: B

View Text Solution

143. Consider the circuit given in figure. The charge in μC on the capacitor having capacity $5\mu F$ is

A. 21

B. 3.6

C. 9

D. 12.6

Answer: C

View Text Solution

144. If the equivalent capacitance between P and Q of the combination of the capacitors shown in figure below is $30\mu F$, the capacitor C is

A. $60\mu F$

B. $30\mu F$

C. $10\mu F$

D. $5\mu F$

Answer: A

View Text Solution

145. In the combination of capacitors shown in figure the potential difference across the plates of the capacitors A will be

A. 4.8 V

B. 6V

C. 1.2V

D. 2.4 V

Answer: C

View Text Solution

146. In the circuit shown in figure. Charge stored in the capacitor of capacitance $5\mu F$ is

A. $20\mu C$

B. zero

C. $60\mu C$

D. $30\mu C$

Answer: B

View Text Solution

147. In the circuit diagram, potential difference between points A and B is 200 V, the potential difference between points a and b when the switch S is open, is

A. 100V

B. $\frac{200}{3}V$

C. $\frac{100}{3}V$

D. 50 V

Answer: B

View Text Solution

148. An electric circuit requires a total capacitance of $2\mu F$ across a potential of 1000V. Large number of $1\mu F$ capacitances are available each of which would breakdown if the potential is more than 350 V. How many capacitances are required to mae the circuit ?

A. 24

B. 20

C. 18

D. 12

Answer: C

View Text Solution

149. In the arrangement of capacitors shown in figure, each capacitor is of $9\mu F$, then the equivalent capacitance between the points A and B is

A. $9\mu F$

B. $18\mu F$

C. $4.5\mu F$

D. $15\mu F$

Answer: D

View Text Solution

150. In how many ways one can arrange three identical capacitors taking either one or two or three capacitors together to obtain distinct effective capacitance?

A. 8

B. 6

C. 4

D. 3

Answer: C

Watch Video Solution

Watch Video Solution

151. The circular plates A and B of a parallel plate air capacitor have a diameter of 0.1 m and are $2 \times 10^{-3} m$ apart. The plates C and D of a similar capacitor have a diameter of $0.12m$ and are $3 \times 10^{-3} m$ apart. Plate A is earthed. Plates B and D are connected together. Plate C is connected to the positive pole of a 120V battery whose negative is earthed. The energy stored in the system is

A. $0.1224 \mu J$

B. $0.2224 \mu J$

C. $0.3224 \mu J$

D. $0.4224 \mu J$

Answer: A

Watch Video Solution

152. Capacitor A is charged to a potential of 100 V and capacitor B is charged to a potential of 75 V. What are the charges on A and B after key K is closed as shown in figure ?

A. $\frac{250}{3}\mu C, \frac{500}{3}\mu C$

B. $\frac{250}{4}\mu C, \frac{250}{3}\mu C$

C. $\frac{500}{4}\mu C, \frac{500}{3}\mu C$

D. $\frac{1250}{4}\mu C, \frac{1250}{3}\mu C$

Answer: A

View Text Solution

153. Two insulated metal spheres of raddi 10 cm and 15 cm charged to a potential of 150 V and 100 V respectively, are connected by means of a metallic wire. What is the charge on the first sphere?

A. 2 e.s.u.

B. 4 e.s.u.

C. 6 e.s.u.

D. 8 e.s.u.

Answer: B

Watch Video Solution

154. The plates of a parallel plate capacitor have an area of $100cm^2$ each and area separated by 2.5 mm. the capacitor is charged to 200V. Calculate the energy stored in the capacitor.

A. $70.8 \times 10^{11} J$

B. $70.8 \times 10^{7} J$

C. $7.08 \times 10^{7} J$

D. $7.08 \times 10^{-7} J$

Answer: D

Watch Video Solution

155. What is the energy stored in the capacitor between terminals A and B of the network shown in the figure ? (Capacitance of each capacitor $C = 1 \mu F$)

A. $12.5 \mu J$

B. Zero

C. $25\mu J$

D. $50\mu J$

Answer: A

View Text Solution

156. A parallel plate capcitor has plate area A and separation d. It is charged to a potential difference V_0. The charging battery is disconnected and the plates are pulled apart to three times the initial separation. The work required to separate the plates is

A. $\frac{\varepsilon_0 A V_0^2}{3d}$

B. $\frac{\varepsilon_0 A V_0^2}{2d}$

C. $\frac{\varepsilon_0 A V_0^2}{4d}$

D. $\frac{\varepsilon_0 A V_0^2}{d}$

Answer: D

Watch Video Solution

157. Two conducting spheres of radii $5cm$ and $10cm$ are given a charge of $15\mu F$ each. After the two spheres are joined by a conducting wire, the charge on the smaller sphere is

A. $20\mu C$

B. $5\mu C$

C. $10\mu C$

D. $15\mu C$

Answer: C

Watch Video Solution

Watch Video Solution

158. Two spherical conductors A and B of radii 1mm and 2mm are separated by a distance of 5 cm and are uniformly charged. If the spheres are connected by a conducting wire then in equilibrium condition, the ratio of the magnitude of the electric fields at the surfaces of spheres A and B is

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

Watch Video Solution

159. Two identical capacitors, have the same capacitance C. One of them is charged to potential V_1 and the other V_2. The negative ends of the capacitors are connected together. When the poistive ends are also connected, the decrease in energy of the combined system is

A. $\frac{1}{4}C\left(V_1^2 - V_2^2\right)$

B. $\frac{1}{4}C\left(V_1^2 + V_2^2\right)$

C. $\frac{1}{4}C(V_1 - V_2)^2$

D. $\frac{1}{4}C(V_1 + V_2)^2$

Answer: C

Watch Video Solution

160. A body of capacity $4\mu F$ is charged to $80V$ and another body of capacity $6\mu F$ is charged to $30V$. When they are connected the energy lost by $4\mu F$ capacitor is

A. 7.8 mJ

B. 4.6 mJ

C. 3.2 mJ

D. 2.5 mJ

Answer: A

Watch Video Solution

Watch Video Solution

161. If the potential of a capacitor having capacity of $6\mu F$ is increased from 10 V to 20 V,then increase in its energy will be

A. $2 \times 10^{-4} J$

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

C. $3 \times 10^{-4} J$

D. $9 \times 10^{-4} J$

Answer: D

Watch Video Solution

162. A parallel plate capacitor of capacity C_0 is charged to a potential V_0, E_1 is the energy stored in the capacitor when the battery is disconnected and the plate separation is doubled, and E_2 is the energy stored in the capacitor when the charging battery is kept connected and the separation between the capacitor plates is dounled. find the ratio E_1 / E_2.

A. 2

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

C. 2

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

Answer: A

Watch Video Solution

163. A $4\mu F$ capacitor is charged by a 200 V supply. It is then disconnected from the supply and is connected to another uncharged $2\mu F$ capacitor. How much electrostatic energy of the first capacitor is disspated in the form of heat and electromagnetic radiation ?

A. $2.67 \times 10^{-2} J$

B. $2.67 \times 10^{-4} J$

C. $3.67 \times 10^{-2} J$

D. $3.67 \times 10^{-4} J$

Answer: A

Watch Video Solution

164. A system consists of two metallic spheres of radii r_1 and r_2 connected by a thin wire and a switch S as shown. Initially S is open and spheres carry charges q_1 and q_2 respectively. If the switch is closed, the potential of the system is

A. $\left(\frac{1}{4\pi\varepsilon_0}\right)\left\{\frac{q_1 q_2}{r_1 r_2}\right\}$

B. $\left(\frac{1}{4\pi\varepsilon_0}\right)\left\{\frac{(q_1+q_2)}{(r_1+r_2)}\right\}$

C. $\left(\frac{1}{4\pi\varepsilon_0}\right)\left\{\left(\frac{q_1}{r_1}\right)+\left(\frac{q_2}{r_2}\right)\right\}$

D. $\left(\frac{1}{4\pi\varepsilon_0}\right)\left\{\frac{(q_1+q_2)}{(r_1r_2)^{1/2}}\right\}$

Answer: B

View Text Solution

165. The figure shows two identical parallel plate capacitors connected to a battery with the switch S closed.

The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant (or relative permittivity) 3. Find the ratio of the total electrostatic energy stored in both capacitors before and after the introduction of the dielectric.

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

B. $\frac{5}{3}$

C. $\frac{3}{5}$

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

Answer: C

View Text Solution

166. If n drops, each of capacitance C and charged to a potential V, coalesce to form a big drop, the ratio of the energy stored in the big drop to that in each small drop will be

A. $n^{5/3}:1$

B. $n^{4/3}:1$

C. n:1

D. $n^3:1$

Answer: A

Watch Video Solution

167. two metal spheres of radii R_1 and R_2 are charged to the same potential. The ratio of charges on the spheres is

A. $\frac{R_1}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\sqrt{\left(\frac{R_1}{R_2}\right)}$

D. $\frac{R_1^2}{R_2^2}$

Answer: B

Watch Video Solution

168. A capacitor or capacitance C_1 is charge to a potential V and then connected in parallel to an uncharged capacitor of capacitance C_2. The fianl potential difference across each capacitor will be

A. $\frac{C_1 V}{C_1 + C_2}$

B. $\dfrac{C_2V}{C_1+C_2}$

C. $1+\dfrac{C_2}{C_1}$

D. $1-\dfrac{C_2}{C_1}$

Answer: A

Watch Video Solution

169. A parallel plate capacitor is charged to a potential difference of 50 volts. It is then discharged through a resistance fior 2 seconds and its potential drops by 10 volts. Calculate the fraction of energy stored in the capacitance.

A. 0.14

B. 0.25

C. 0.50

D. 0.64

Answer: D

Watch Video Solution

1. An electron initially at rest falls a distance of 2 cm in a uniform electric field of magnitude $3 \times 10^4 NC^{-1}$. The time taken by the electron to fall to this distance is

A. $1.3 \times 10^2 s$

B. $2.1 \times 10^{-12} s$

C. $1.6 \times 10^{-10} s$

D. $2.75 \times 10^{-9} s$

Answer: D

Watch Video Solution

Neet Vitals

1. A conducting sphere of radius 10 cm has unknown charge. If the electric field at a distance 20 cm from the centre of the sphere is $-1.2 \times 10^3 NC^{-1}$ and points radially inwards. The net charge on the sphere is

A. $-4.5 \times 10^{-9} C$

B. $4.5 \times 10^9 C$

C. $-5.3 \times 10^{-9} C$

D. $5.3 \times 10^{9} C$

Answer: C

Watch Video Solution

2. An oil drop of 10 excess electron is held stationary under a consatnt electric field of $3.6 \times 10^{4} NC^{-1}$ in Millikan's oil drop experiment. The density of oil is $1.26 gcm^{-3}$.

Radius of the oil drop is

(Take, $g = 9.8 ms^{-2}, e = 1.6 \times 10^{-19} C$)

A. $1.0 \times 10^{-6} m$

B. $4.8 \times 10^{-5} m$

C. $4.8 \times 10^{-18} m$

D. $1.13 \times 10^{-18} m$

Answer: A

Watch Video Solution

3. Under the action of a given coulombic force the acceleration of an electron is $3.5 \times 10^{25} ms^{-2}$. Then the magnitude of the acceleration of a proton under the action of same force is nearly

A. $1.6 \times 10^{-19} ms^{-2}$

B. $9.1 \times 10^{31} ms^{-2}$

C. $1.9 \times 10^{22} ms^{-2}$

D. $1.6 \times 10^{27} ms^{-2}$

Answer: C

Watch Video Solution

4. A rod of length 2.4 m and radius 4.6 mm carries a negative charge of $4.2 \times 10^{-7} C$ spread uniformly over it surface. The electric field near the mid-point of the rod, at a point on its surface is

A. $-8.6 \times 10^5 NC^{-1}$

B. $8.6 \times 10^4 NC^{-1}$

C. $-6.7 \times 10^5 NC^{-1}$

D. $6.7 \times 10^4 NC^{-1}$

Answer: C

Watch Video Solution

5. The ratio of magnitude of electrostatic force and gravitational force for an electron and a proton is

A. 6.6×10^{39}

B. 2.3×10^{39}

C. 6.6×10^{29}

D. 2.3×10^{29}

Answer: B

Watch Video Solution

6. The electrostatic potential inside a charged spherical ball is given by $\phi = ar^2 + b$ where r is the distance from the centre and a, b are constants. Then the charge density inside the ball is:

A. $-24\pi a\varepsilon_0 r$

B. $-6a\varepsilon_0 r^3$

C. $-24\pi a\varepsilon_0$

D. $-8\pi\varepsilon_0 a\pi$

Answer: D

Watch Video Solution

7. Electrical as well as gravitational affects can be thought to be caused by fields. Which of the following is true of an electrical or gravitational field?

A. The field concept is often used to describe contact force.

B. Gravitational or electric field does not always exist in the space around an object.

C. Fields are useful for understandig forces acting through a distance.

D. There is no way to verify the existence of a force field source it is just a concept.

Answer: C

Watch Video Solution

8. If an object of mass 1 kg contains 4×10^{20} atoms. If one electron is removed from every atom of the solid, the charge gained by the solid in 1 g is

A. 2.8 C

B. $6.4 \times 10^{-2} C$

C. $3.6 \times 10^{-3} C$

D. $9.2 \times 10^{-4} C$

Answer: B

Watch Video Solution

9. Two point charges of $1 \mu C$ and $-1 \mu C$ are separated by a distance of 100 Å. A point P is at a distance of 10 cm from the midpoint and on the perpendicular bisector of the line joining the two charges. The electric field at P will be

A. $9NC^{-1}$

B. $0.9NC^{-1}$

C. $90NC^{-1}$

D. $0.09NC^{-1}$

Answer: D

Watch Video Solution

10. Two identical positive charges are placed at $x = -a$ and $x = a$. The correct variation of potential V along the x-axis is given by

A.

B.

C.

D.

Answer: A

Watch Video Solution

11. In a typical lightning flash, the potential difference between discharge points is about $1.0 \times 10^9 V$ and the quantity of charge transferred I about 30 C. IF all the energy released could be used to accelerate a 1200 kg automobile from rest, what would be the final speed of the automobile ?

A. $7100ms^{-1}$

B. $3600ms^{-1}$

C. $9500ms^{-1}$

D. $6800ms^{-1}$

Answer: A

Watch Video Solution

12. Two capacitor each having capacitance C and breakdown voltage V are joind in series .The capacitance and the breakdown voltage of the combination will be

A. 2C and 2V

B. C/2 and V/2

C. 2C and V/2

D. C/2 and 2V

Answer: D

Watch Video Solution

13. An ammonia molecule has permanent electric dipole moment = 1.47D, where I D = 1 debye unit $= 3.34 \times 10^{-30} Cm$. Calculate electric potential due to this molecule at a point 52.0 nm away along the axis of the dipole. Assumme V = 0 at infinity.

A. $10.3\mu V$

B. $16.3\mu V$

C. $20.3\mu V$

D. $26.3\mu V$

Answer: B

Watch Video Solution

14. Three point charges q, 2q and 8q are to be placed on a

. 9cm long straight line. Find the

. positions where the charges shouldbe placed

such that the potential energy

. of this sysrem is minimum. In this situation,

what is the

. electric field at the charge q due to the other

two charges?

A. charge q between charges 2q and 8q

and 5 cm from charge 2q.

B. charge q between charges 2q and 8q

and 5 cm from charge 2q.

C. charge 2q between charges q and 8q and 5 cm from charge q.

D. charge 2q between charges q and 8q and 7 cm from charge 2q.

Answer: A

Watch Video Solution

15. Which of the following statements is incorrect regarding equipotential surfaces ?

A. Equipotential surfaces are closer in regions of large electric fields compared to regions of lower electric fields.

B. Equipotential surfaces will be more crowded near sharp edges of a conductor.

C. Equipotential surface will be more crowded near regions of large charge densities

D. equipotential surfaces will always be equally spaced.

Answer: D

Watch Video Solution

16. An electric dipole of length $2cm$ is placed with its axis making an angle 30° to a uniform electric field $10^5 \frac{N}{C}$ .If it experiences a torque of $10\sqrt{3}$Nm ,then potential energy of the dipole ..

A. $-10J$

B. $-20J$

C. $-30J$

D. $-40J$

Answer: C

Watch Video Solution

17. Three charges -1, +q and +q are situated in x-y plane at points (0, -a)(0,0) and (0, a) respectively. The potential at a point distant

$r(r > a)$ in a direction making an angle θ from y - axis will be

A. $\dfrac{kq}{r}$

B. $\dfrac{kq}{r^2}(2a\cos\theta)$

C. $\dfrac{kq}{r}\left(1+\dfrac{2a\cos\theta}{r}\right)$

D. $\dfrac{kq}{a}$

Answer: C

View Text Solution

18. A charge Q has been divided on two concentric conducting spheres of radii R_1 and $R_2 (R_1 > R_1)$ such that the surface charge densities on both the spheres are equal. The potential at their common centre is

A. $\frac{1}{4\pi\varepsilon_0}\frac{Q\left(R_1^2+R_2^2\right)}{\left(R_1+R_2\right)}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{Q(R_1+R_2)}{\left(R_1^2+R_2^2\right)}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{QR_1R_2}{(R_1+R_2)}$

D. $\frac{1}{4\pi\varepsilon_0}\frac{Q(R_1R_2)}{R_1R_2}$

Answer: B

View Text Solution

Aipmt Neet Mcq S

1. Two positive ions , each carrying a charge q , are separated by a distance d.If F is the force of repulsion between the ions , the number of electrons missing from each ion will be (e being the charge on an electron)

A. $\dfrac{4\pi\varepsilon_0 F d^2}{e^2}$

B. $\sqrt{\dfrac{4\pi\varepsilon_0 F e^2}{d^2}}$

C. $\sqrt{\dfrac{4\pi\varepsilon_0 Fe^2}{e^2}}$

D. $\dfrac{4\pi\varepsilon_0 Fd^2}{q^2}$

Answer: C

Watch Video Solution

2. A series combination of n_1 capacitors, each of value C_1, is charged by a source of potential difference $4V$. When another parallel combination of n_2 capacitors, each of value C_2, is charged by a source of potential difference

V, it has same (total) energy stored in it, as the first combination has. the value of C_2, in terms of C_1, is then

A. $\frac{2C_1}{n_1 n_2}$

B. $16\frac{n_2}{n_1}C_1$

C. $2\frac{n_2}{n_1}C$

D. $\frac{16C_1}{n_1 n_2}$

Answer: D

Watch Video Solution

3. Two parallel metal plates having charges $+Q$ and $-Q$ face each other at a certain distance between them.If the plates are now dipped in kerosene oil tank ,the electric field between the plates will

A. become zero

B. increase

C. decrease

D. remain same

Answer: C

Watch Video Solution

4. The electric field at a distance $\frac{3R}{2}$ from the centre of a charged conducting spherical shell of radius R is E. The electric field at a distance $\frac{R}{2}$ from the centre of the sphere is :

A. zero

B. E

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

D. $\frac{E}{3}$

Answer: A

Watch Video Solution

5. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will

A. increase four times

B. be reduced to half

C. remain the same

D. be doubled

Answer: C

Watch Video Solution

6. A parallel plate condenser has a unifrom electric field $E(V/m)$ in the space between the plates. If the distance between the plates is $d(m)$ and area of each plate is $A(m^2)$ the energy (joule) stored in the condenser is

A. $E^2 Ad/\varepsilon_0$

B. $\frac{1}{2}\varepsilon_0 E^2$

C. $\varepsilon_0 EAd$

D. $\frac{1}{2}\varepsilon_0 E^2 Ad$

Answer: D

Watch Video Solution

7. Four electric charges +q, +q, -q and -q are placed at the corners of a square of side 2L. The electric potential at point A, midway between the two charges +q and +q, is

A. $\frac{1}{4\pi\varepsilon_0}\frac{2q}{L}(1+\sqrt{5})$

B. $\frac{1}{4\pi\varepsilon_0}\frac{2q}{L}\left(1+\frac{1}{\sqrt{5}}\right)$

C. $\frac{1}{4\pi\varepsilon_0}\frac{2q}{L}\left(1-\frac{1}{\sqrt{5}}\right)$

D. zero

Answer: C

View Text Solution

8. Three charges, each +q, are placed at the corners of an isosceles triangle ABC of sides

BC and AC, 2a. D and E are third mid points of BC and CA. The work done in taking a charge Q from D to E is

A. $\frac{3qQ}{4\pi\varepsilon_0 a}$

B. $\frac{3qQ}{8\pi\varepsilon_0 a}$

C. $\frac{qQ}{4\pi\varepsilon_0 a}$

D. zero

Answer: D

View Text Solution

9. The electric potential V at any point (x,y, z) in space is given by $V = 4x^2 V$. The electric field E (in $\frac{V}{m}$) at the point (1,0,2) is

A. 8 along negative X-axis

B. 8 along positive X-axis

C. 16 along negative X-axis

D. 16 along positive X-axis

Answer: A

Watch Video Solution

10. An electric dipole moment p is placed in an electric field of intensity $'E'$. The dipole acquires a position such that the axis of the dipole makes an angle θ with the direction of the field. Assuming that the potential energy of the dipole to be zero when $\theta = 90^\circ$, the torque and the potential energy of the dipole will respectively be

A. $pE\sin\theta, \ - pE\cos\theta$

B. $pE\sin\theta, \ - 2pE\cos\theta$

C. $pE \sin \theta, 2pE \cos \theta$

D. $pE \cos \theta, \ - pE \sin \theta$

Answer: A

Watch Video Solution

11. Four point charges $-Q, \ - q, 2q$ and $2Q$ are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero is

A. Q = - q

B. $Q = -\frac{1}{q}$

C. Q = q

D. $Q = \frac{1}{q}$

Answer: A

Watch Video Solution

12. The total electric flux through a cube when a charge 8q is placed at one corner of the cube is

A. $\frac{2q}{\varepsilon_0}$

B. $\frac{q}{8\varepsilon_0}$

C. $\frac{q}{\varepsilon_0}$

D. $\frac{q}{2\varepsilon_0}6a^2$

Answer: B

Watch Video Solution

13. A parallel plate capacitor has a uniform electric field E in the space between the the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is

A. $\frac{1}{2}\varepsilon_0 E^2$

B. $\frac{E^2 Ad}{\varepsilon_0}$

C. $\frac{1}{2}\varepsilon_0 E^2 Ad$

D. $\varepsilon_0 Ead$

Answer: C

Watch Video Solution

14. Two metallic spheres of radii 1 cm and 3 cm are given charges of $-1 \times 10^{-2} C$ and $5 \times 10^{-2} C$, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is

A. $2 \times 10^{-2} C$

B. $3 \times 10^{-2} C$

C. $4 \times 10^{-2} C$

D. $1 \times 10^{-2} C$

Answer: B

Watch Video Solution

15. A, B and C are three points in a uniform electric field. The electric potential is

A. maximum at C

B. same at all the three points A, B and C

C. maximum at A

D. maximum at B

Answer: D

View Text Solution

16. A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are

A. zero and $\frac{Q}{4\pi\varepsilon_0 R^2}$

B. $\frac{Q}{4\pi\varepsilon_0 R}$ and zero

C. $\frac{Q}{4\pi\varepsilon_0 R}$ and $\frac{Q}{4\pi\varepsilon_0 R^2}$

D. both the zero

Answer: B

Watch Video Solution

17. In a region, the potential is respresented by $V(x, y, z) = 6x - 8xy - 8y + 6yz$, where V is in volts and x, y, z are in meters. The electric force experienced by a charge of 2 coulomb situated at point $(1, 1, 1)$ is

A. $6\sqrt{5}N$

B. 30 N

C. 24 N

D. $4\sqrt{35}N$

Answer: D

Watch Video Solution

18. The electric field in a certain region is acting radially outwards and is given by $E = Ar$. A charge contained in a sphere of radius $'a'$ centred at the origin of the field, will given by

A. $4\pi\varepsilon_0 Aa^3$

B. $\varepsilon_0 Aa^3$

C. $4\pi\varepsilon_0 Aa^2$

D. $A\varepsilon_0 a^2$

Answer: A

Watch Video Solution

19. A parallel plate air capacitor of capacitance C is connected to a cell of $emFV$ and then disconnected from it. A dielectric slab of dielectric constant K, which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is incorrect ?

A. The change in energy stored is $\frac{1}{2}CV^2\left(\frac{1}{K}-1\right)$.

B. The charge on the capacitor is not conserved.

C. The potential difference between the plates decreases K times.

D. The energy stored in the capacitor decreases K times.

Answer: B

Watch Video Solution

20. A parallel plate air capacitor has capcity C distance of separtion between plates is d and potential difference V is applied between the plates force of attraction between the plates of the parallel plate air capacitor is

A. $\frac{CV^2}{d}$

B. $\frac{C^2V^2}{2d^2}$

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

D. $\frac{CV^2}{2d}$

Answer: D

Watch Video Solution

21. If potential (in volts) in a region is expressed as V(x, y, z) = 6xy - y + 2yz, the electric field (in N/C) at point (1, 1, 0) is :

A. $-\left(2\hat{i}+3\hat{j}+\hat{k}\right)$

B. $-\left(6\hat{i}+9\hat{j}+\hat{k}\right)$

C. $-\left(3\hat{i}+5\hat{j}+3\hat{k}\right)$

D. $-\left(6\hat{i}+5\hat{j}+2\hat{k}\right)$

Answer: D

Watch Video Solution

22. A capacitor of $2\mu F$ is charged as shown in the diagram. When the switch S is turned to position 2, the precentage of its stored energy dissipated is

A. $75\ \%$

B. $80\ \%$

C. $0\ \%$

D. $20\ \%$

Answer: B

View Text Solution

23. Two identical charged spheres suspended form a common point by two massless strings of lengths l, are initially at a distance $d(d > > l)$ apart because of their mutual repulsion. The charges brgin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity v. Then v varies as a function of the distance x between the spheres, as

A. $v \propto x^{-1/2}$

B. $v \propto x^{-1}$

C. $v \propto x^{1/2}$

D. $v \propto x$

Answer: A

Watch Video Solution

24. An electric dipole is placed at an angle of 30° with an electric field intensity $2 \times 10^5 N/C$. It experiences a torque equal to $4Nm$. The charge on the dipole, if the dipole is length is $2cm$, is

A. 8 mC

B. 2 mC

C. 5 mC

D. $7\mu C$

Answer: B

Watch Video Solution

25. A parallel-plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric material having dielectric constant k_1, k_2, k_3 and k_4 as shown in the figure. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by

A. $k = k_1 + k_2 + k_3 + 3k_4$

B. $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$

C. $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

D. $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

Answer: C

View Text Solution

26. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system:

A. decreases by a factor of 2

B. remains the same

C. increases by a factor of 2

D. increases by a factor of 4

Answer: A

Watch Video Solution

27. Suppose the charge of a proton and an electron differ slightly. One of them is $-e$, the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero. Then Δe is of the order of [Given mass of hydrogen $m_h = 1.67 \times 10^{-27} kg$]

A. $10^{-23} C$

B. $10^{-37} C$

C. $10^{-47} C$

D. $10^{-20} C$

Answer: B

Watch Video Solution

28. The diagrams below show regions of equipotentials.

A positive charge is moved from A to B in each diagram.

A. In all the four cases the work done is the same.

B. Minimum work is required to move q in figure (I)

C. Maximum work is required to move q in figure (II)

D. Maximum work is required to move q in figure (III)

Answer: A

View Text Solution

29. The electrostatic force between the metal plate of an isolated parallel plate capacitro C having charge Q and area A, is

A. Independent of the distance between the plates

B. Linearly proportional to the distance between the plates

C. Propotional to the square root of the distance between the plates

D. Inversely propotional to the distance between the plates

Answer: A

Watch Video Solution

30. An electron falls from rest through a vertical distance h in a uniform and vertically upwards directed electric field E. The direction of electric field is now reversed , keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall proton is

A. smaller

B. 5 times greater

C. 10 times greater

D. equal

Answer: A

Watch Video Solution

31. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\overrightarrow{E}$. Due to the force $q\overrightarrow{E}$, its velocity increases from 0 to $6m/s$ in one second duration. At that instant the direction of field is reversed.

The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively.

A. $2ms^{-1}, 4ms^{-1}$

B. $1ms^{-1}, 3ms^{-1}$

C. $1ms^{-1}, 3.5ms^{-1}$

D. $1.5ms^{-1}, 3ms^{-1}$

Answer: B

Watch Video Solution

32. A hallow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre:

A. decreases as r increases for $r < R$ and for $r > R$

B. increases as r increases for $r < R$ and for $r > R$

C. zero as r increases for $r < R$, decreases as r increases for $r > R$

D. zero as r increases for $r < R$, increases as r increases for $r > R$

Answer: C

Watch Video Solution

33. Two point charges A and B, having charges +Q and -Q respectively, are placed at certain distance apart and force acting between them is F, if 25% charge of A is transferred to B, then force between the charges becomes:

A. $\frac{4F}{3}$

B. F

C. $\frac{9F}{16}$

D. $\frac{16F}{9}$

Answer: C

Watch Video Solution

34. Two parallel infinite line charges with linear charge densities $+\lambda C/m$ and $-\lambda$ C/m are placed at a distance of 2R in free space. What is the electric field mid-way between the two line charges?

A. $\frac{\lambda}{2\pi\varepsilon_0 R} N/C$

B. zero

C. $\frac{2\lambda}{\pi\varepsilon_0 R} N/C$

D. $\frac{\lambda}{\pi\varepsilon_0 R}$

Answer: D

Watch Video Solution