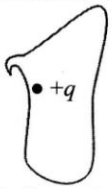
1. A hemisphere is uniformly charged positively. The electric field at a point on the diameter, and away from the centre is directed
(a) perpendicular to the diameter (b) parallel to the diameter
(c) at an angle tilted towards the diameter (d) at an angle tilted away from the diameter

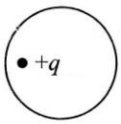
2. The number of electrons present in –1 C of charge is
(a) 6×10^{18} (b) 1.6×10^{19} (c) 6×10^{19} (d) 1.6×10^{18}

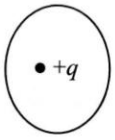
3. There are two types of electric charges positive charges and negative charges. The property which differentiates the two types of charges is
(a) field of charge (b) amount of charge (c) strength of charge (d) polarity of charge

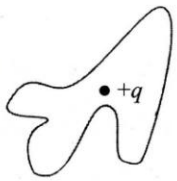
4. The electric field at a point is
(a) always continuous (b) continuous if there is no charge at that point
(c) discontinuous if there is a charge at that point (d) both (b) and (c) are correct

5. The electric flux through the surface

I. 

II. 

III. 

IV. 

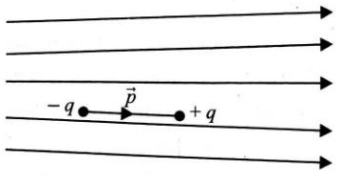
(a) in figure (IV) is largest (b) in figure (III) is the least
(c) in figure (II) is same as in figure (III) but is smaller than figure (IV)
(d) is the same for all figures

6. A cup contains 250 g of water. Find the number of positive charges present in the cup of water.
(a) 1.34×10^{19} C (b) 1.34×10^{7} C (c) 2.43×10^{19} C (d) 2.43×10^{7} C

7. Consider the charges q, q and $-q$ placed at the vertices of an equilateral triangle of each side l. The force on the system of charges is
(a) $\frac{q^2}{4\pi\varepsilon_0 l}$ (b) $\frac{q^3}{4\pi\varepsilon_0 l}$ (c) $\frac{q^2}{4\pi\varepsilon_0 l^2}$ (d) zero

8. Which of the following statements is not true about electric field lines?
(a) Electric field lines start from positive charge and end at negative charge.
(b) Two electric field lines can never cross each other.
(c) Electrostatic field lines do not form any closed loops.
(d) Electric field lines cannot be taken as continuous curve.

9. Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct?
(a) The dipole will not experience any force.
(b) The dipole will experience a force towards right.
(c) The dipole will experience a force towards left.
(d) The dipole will experience a force upwards.



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

(a) 1.3×10^2 s (b) 2.1×10^{-12} s (c) 1.6×10^{-10} s (d) 2.9×10^{-9} s

11. If $\iint_s \vec{E}.\vec{ds} = 0$ over a surface, then

(a) the electric field inside the surface and on it is zero. (b) the electric field inside the surface is necessarily uniform.

(c) all charges must necessarily be outside the surface. (d) all of these.

12. The force between two small charged spheres having charges of 1×10^{-7} C and 2×10^{-7} C placed 20 cm apart in air is

(a) 4.5×10^{-2} N (b) 4.5×10^{-3} N (c) 5.4×10^{-2} N (d) 5.4×10^{-3} N

13. An electric dipole with dipole moment 2×10^{-19} cm is aligned at 30° with the direction of a uniform electric field of magnitude 4×10^4 N C^{-1}. The magnitude of the torque acting on the dipole is

(a) 2×10^{-5} N m (b) 2×10^{-4} N m (c) 4×10^{-4} N m (d) 4×10^{-5} N m

14. A conducting sphere of radius 20 cm has as unknown charge. If the electric field at a distance 40 cm from the centre of the sphere is 1.2×10^3 N C^{-1} and points radially inwards. The net charge on the sphere is

(a) -4.5×10^{-9} C (b) 4.5×10^9 C (c) -5.3×10^{-9} C (d) 5.3×10^9 C

15. A point charge $+q$, is placed at a distance d from an isolated conducting plane. The field at a point P on the other side of the plane is

(a) directed perpendicular to the plane and away from the plane.

(b) directed perpendicular to the plane but towards the plane.

(c) directed radially away from the point charge. (d) directed radially towards the point charge.

16. A polythene piece rubbed with wool is found to have a negative charge of 6×10^{-7} C. The number of electrons transferred to polythene from wool is

(a) 3.75×10^{10} (b) 9.6×10^{10} (c) 9.6×10^{12} (d) 3.75×10^{12}

17. If there were only one type of charge in the universe, then

(a) $\oint_s \vec{E}.d\vec{s} \neq 0$ on any surface (b) $\oint_s \vec{E}.d\vec{s} = 0$ if the charge is outside the surface

(c) $\oint_s \vec{E}.d\vec{s} = \frac{q}{\varepsilon_0}$ if charges of magnitude q were inside the surface

(d) both (b) and (c) are correct

18. What will happen when we rub a glass rod with silk cloth?

(a) Some of the electrons from the glass rod are transferred to the silk cloth.

(b) The glass rod gets positively charged and silk cloth gets negatively charged.

(c) New charge is created in the process of rubbing.

(d) both (a) and (b) are correct.

19. If 10^9 electrons move out of a body to another body every second, then the time required to get a total charge of 1 C on the other body is

(a) 250 years (b) 100 years (c) 198 years (d) 150 years

20. An oil drop of 10 excess electrons is held stationary under a constant electric field of 3.65×10^4 N C^{-1} in Millikan's oil drop experiment. The density of oil is 1.26 g cm^{-3}. Radius of the oil drop is (Take, $g = 9.8$ m s^{-2}, $e = 1.6 \times 10^{-19}$ C)

(a) 1.1×10^{-6} m (b) 4.8×10^{-5} m (c) 4.8×10^{-18} m (d) 1.13×10^{-18} m

21. The electric field that can balance an electron of mass 3.2×10^{-27} kg is

(a) 19.6×10^{-8} N C^{-1} (b) 20×10^{-6} N C^{-1} (c) 19.6×10^8 N C^{-1} (d) 20×10^6 N C^{-1}

22. Consider a region inside which there are various types of charges but the total charge is zero. At points outside the region

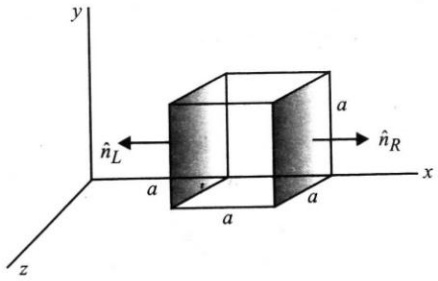
(a) the electric field is necessarily zero.

(b) the electric field is due to the dipole moment of the charge distribution only.

(c) the dominant electric field is inversely proportional to r^3, for large r (distance from origin).

(d) the work done to move a charged particle along a closed path, away from the region will not be zero.

23. The electric field components in the given figure are $E_x = \alpha x^{1/2}$, $E_y = E_z = 0$ in which $\alpha = 800\ \text{N C}^{-1}\ \text{m}^{-1/2}$. The charge within the cube is if net flux through the cube is $1.05\ \text{N m}^2\ \text{C}^{-1}$ (assume $a = 0.1$ m)



(a) 9.27×10^{-12} C (b) 9.27×10^{12} C
(c) 6.97×10^{-12} C (d) 6.97×10^{12} C

24. Which of the following statements about dipole moment is not true?

(a) The dimensions of dipole moment is [LTA].
(b) The unit of dipole moment is Cm.
(c) Dipole moment is vector quantity and directed from negative to positive charge.
(d) Dipole moment is a vector quantity and has magnitude (charge) q × (separation between charge) a.

25. Match the following and find the correct option.

Column I		Column II	
(A)	Linear charge density	(p)	$\frac{\text{Charge}}{\text{Volume}}$
(B)	Surface charge density	(q)	$\frac{\text{Charge}}{\text{Length}}$
(C)	Volume charge density	(r)	$\frac{\text{Charge}}{\text{Area}}$

(a) (A) → (q), (B) → (r), (C) → (p) (b) (A) → (p), (B) → (r), (C) → (p)
(c) (A) → (r), (B) → (p), (C) → (q) (d) (A) → (r), (B) → (q), (C) → (p)

26. The SI unit of electric flux is

(a) $\text{N C}^{-1}\ \text{m}^2$ (b) N C m^{-2} (c) $\text{N C}^{-2}\ \text{m}^2$ (d) $\text{N C}^{-1}\ \text{m}^{-2}$

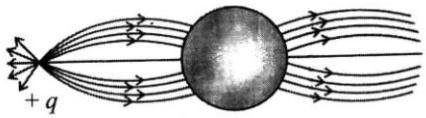
27. The electrostatic force on a small sphere of charge 0.2 μC due to another small sphere of charge –0.4 μC in air is 0.4 N. The distance between the two spheres is

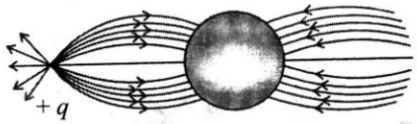
(a) 4.2×10^{-6} m (b) 4.2×10^{-3} m (c) 1.8×10^{-3} m (d) 1.8×10^{-6} m

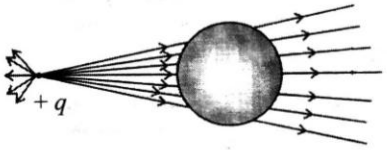
28. A uniformly charged conducting sphere of 4.4 m diameter has a surface charge density of 60 $\mu\text{C m}^{-2}$. The charge on the sphere is

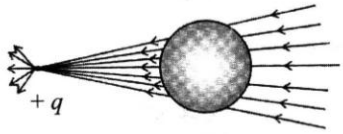
(a) 7.3×10^{-3} C (b) 3.7×10^{-6} C (c) 7.3×10^{-6} C (d) 3.7×10^{-3} C

29. A point positive charge is brought near an isolated conducting sphere. The electric field is best given by

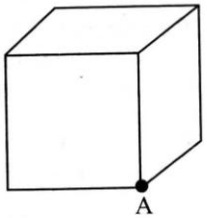
(a) 

(b) 

(c) 

(d) 

30. The total flux through the faces of the cube with side of length 'a' if a charge q is placed at corner A of the cube is



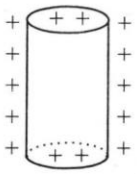
(a) $\frac{q}{8\varepsilon_0}$

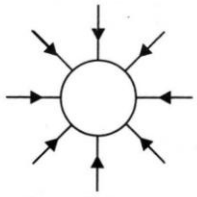
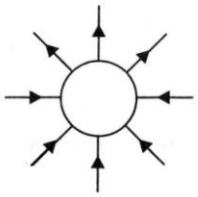
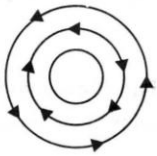
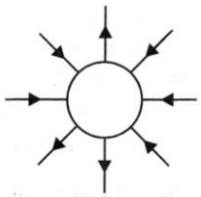
(b) $\frac{q}{4\varepsilon_0}$

(c) $\frac{q}{2\varepsilon_0}$

(d) $\frac{q}{\varepsilon_0}$

31. Which of the following figures correctly shows the top view sketch of the electric field lines for a uniformly charged hollow cylinder as shown is figure?



(a)  (b)  (c)  (d) 

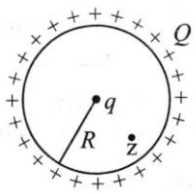
32. The number of electrons that must be removed from an electrically neutral silver dollar to give it a charge of + 2.4 C is

(a) 2.5×10^{19} (b) 1.5×10^{19} (c) 1.5×10^{-19} (d) 2.5×10^{-19}

33. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude 16×10^{-22} C m^{-2}. The electric field between the plates is

(a) 1.8×10^{-10} N C^{-1} (b) 1.9×10^{-10} N C^{-1} (c) 1.6×10^{-10} N C^{-1} (d) 1.5×10^{-10} N C^{-1}

34. A positive charge Q is uniformly distributed along a circular ring of radius R. A small test charge q is placed at the centre of the ring as shown in figure. Then



(a) if $q > 0$, and is displaced away from the centre in the plane of the ring, it will be pushed back towards the centre.

(b) if $q < 0$ and is displaced away from the centre in the plane of the ring, it will never return to the centre and will continue moving till it hits the ring.

(c) if $q < 0$ it will perform SHM for small displacement along the axis.

(d) all of the above

35. The nucleus of helium atom contains two protons that are separated by distance 3.0×10^{-15} m. The magnitude of the electrostatic force that each proton exerts on the other is

(a) 20.6 N (b) 25.6 N (c) 15.6 N (d) 12.6 N

36. Which of the following statements is not true about Gauss's law?

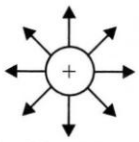
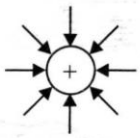
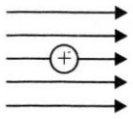
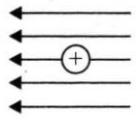
(a) Gauss's law is true for any closed surface.

(b) The term q on the right side of Gauss's law includes the sum of all charges enclosed by the surface.

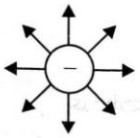
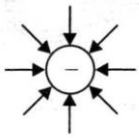
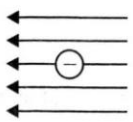
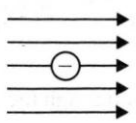
(c) Gauss's law is not much useful in calculating electrostatic field when the system has some symmetry.

(d) Gauss's law is based on the inverse square dependence on distance contained in the coulomb's law.

37. Which of the following figure represents the electric field lines due to a single positive charge ?

(a)  (b)  (c)  (d) 

38. Which of the following figure represents the electric field lines due to a single negative charge?

(a)  (b)  (c)  (d) 

39. Under the action of a given coulombic force the acceleration of an electron is 2.5×10^{22} m s^{-2}. Then the magnitude of the acceleration of a proton under the action of same force is nearly

(a) 1.6×10^{-19} m s^{-2} (b) 9.1×10^{31} m s^{-2} (c) 1.5×10^{19} m s^{-2} (d) 1.6×10^{27} m s^{-2}

40. Which of the following is true inside a conducting sphere with a net positive charge that is insulated from the ground?

(a) The electric field and the electric potential are zero (b) The electric field is not zero but electric potential is zero

(c) The electric field and electric potential are non zero and equal

(d) The electric field is zero, and the electric potential is equal to the electric potential at the surface.

1. A capacitor of capacitance 700 pF is charged by 100 V battery. The electrostatic energy stored by the capacitor is
(a) 2.5×10^{-8} J (b) 3.5×10^{-6} J (c) 2.5×10^{-4} J (d) 3.5×10^{-4} J

2. Consider a uniform electric field in the z-direction. The potential is a constant
(a) for any x for a given z (b) for any y for a given z
(c) on the x-y plane for a given z (d) all of these

3. In a region of constant potential
(a) the electric field is uniform. (b) the electric field is zero.
(c) there can be no charge inside the region. (d) both (b) and (c) are correct.

4. A molecule of a substance has a permanent electric dipole moment of magnitude 10^{-30} cm. A mole of this substance is polarised by applying a strong electrostatic field of magnitude 10^7 V m^{-1}. The direction of field is changed by an angle 60°. The heat released by the substance in aligning its dipole along the new direction of the field is
(a) –6 J (b) –3 J (c) 3 J (d) 6 J

5. A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge
(a) remains a constant because the electric field is uniform.
(b) increases because the charge moves along the electric field.
(c) decreases because the charge moves along the electric field.
(d) decreases because the charge moves opposite to the electric field.

6. A parallel plate capacitor with air between the plates has a capacitance of 10 pF. The capacitance, if the distance between the plates is reduced by half and the space between them is filled with a substance of dielectric constant 4 is
(a) 80 pF (b) 96 pF (c) 100 pF (d) 120 pF

7. A cube of side x has a charge q at each of its vertices. The potential due to this charge array at the centre of the cube is
(a) $\frac{4q}{3\pi\varepsilon_o x}$ (b) $\frac{4q}{\sqrt{3}\pi\varepsilon_o x}$ (c) $\frac{3q}{4\pi\varepsilon_o x}$ (d) $\frac{2q}{\sqrt{3}\pi\varepsilon_o x}$

8. Equipotentials at a great distance from a collection of charges whose total sum is not zero are approximately
(a) spheres (b) planes (c) paraboloids (d) ellipsoids

9. If a conductor has a potential $V \neq 0$ and there are no charges anywhere else outside, then
(a) there must be charges on the surface or inside itself. (b) there cannot be any charge in the body of the conductor.
(c) there must be charges only on the surface. (d) both (a) and (b) are correct.

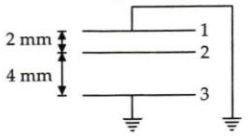
10. Van de Graaff generator is used to
(a) store electrical energy (b) build up high voltages of few million volts
(c) decelerate charged particle like electrons (d) both (a) and (b) are correct

11. A capacitor has some dielectric between its plates, and the capacitor is connected to a dc source. The battery is now disconnected and then the dielectric is removed, then
(a) capacitance will increase. (b) energy stored will decrease.
(c) electric field will increase. (d) voltage will decrease.

22. 16 pF capacitor is connected to 70 V supply. The amount of electric energy stored in the capacitor is

(a) 4.5×10^{-12} J (b) 5.1×10^{-8} J (c) 2.5×10^{-12} J (d) 3.2×10^{-8} J

23. Two parallel conducting plates of area $A = 2.5$ m^2 each are placed 6 mm 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 1 C. The potential of the central plate is

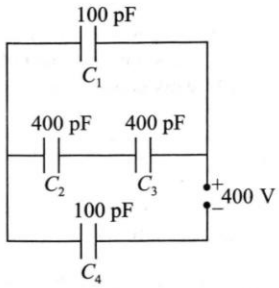


(a) 6×10^7 V
(b) 3×10^7 V
(c) 4×10^7 V
(d) 2×10^7 V

24. Two charged conducting spheres of radii a and b are connected to each other by a wire. The ratio of electric fields at the surfaces of two spheres is

(a) $\frac{a}{b}$ (b) $\frac{b}{a}$ (c) $\frac{a^2}{b^2}$ (d) $\frac{b^2}{a^2}$

25. The equivalent capacitance for the network shown in the figure is



(a) $\frac{1200}{7}$ pF
(b) $\frac{1000}{4}$ pF
(c) $\frac{1800}{7}$ pF
(d) $\frac{1300}{3}$ pF

26. In a Van de Graaff type generator, a spherical metal shell is to be 15×10^6 V electrode. The dielectric strength of the gas surrounding the electrode is 5×10^7 Vm^{-1}. The minimum radius of the spherical shell required is

(a) 1 m (b) 2 m (c) 1.5 m (d) 3 m

27. If a charged spherical conductor of radius 10 cm has potential V at a point distant 5 cm from its centre, then the potential at a point distance 15 cm from the centre will be

(a) $3V$ (b) $\frac{3}{2}V$ (c) $\frac{2}{3}V$ (d) $\frac{1}{3}V$

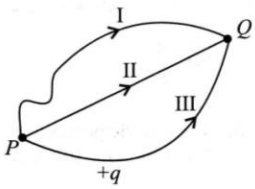
28. The electrostatic potential on the surface of a charged conducting sphere is 100 V. Two statements are made in this regard

(i) At any point inside the sphere, electric intensity is zero
(ii) At any point inside the sphere, the electrostatic potential is less than 100 V.

Which of the following is a correct statement?

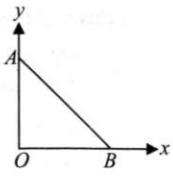
(a) Statement (i) is true but statement (ii) is false (b) Both statements (i) and (ii) are false
(c) Statement (i) is true, statement (ii) is also true and (i) is the cause of (ii)
(d) Statement (i) is true, statement (ii) is also true but the statements are independent.

29. Which among the following statement is true about the work done in bringing a unit positive charge from point P to Q in an electrostatic field?



(a) Minimum work is done in case of path II.
(b) Maximum work is done in case of path I.
(c) Work done is same in all the three paths.
(d) Work done is zero in case of path II.

30. As per the diagram a point charge $+q$ is placed at the origin O. Work done in taking another point charge $-Q$ from the point A [coordinates $(0, a)$] to another point B [coordinates $(a, 0)$] along the straight line AB is

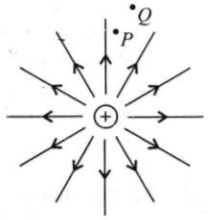


(a) zero
(b) $\left(\frac{qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\sqrt{2}a$
(c) $\left(\frac{-qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\sqrt{2}a$
(d) $\left(\frac{qQ}{4\pi\varepsilon_0}\frac{1}{a^2}\right)\frac{a}{\sqrt{2}}$

31. A parallel plate air capacitor is charged to a potential difference of V volts. After disconnecting the charging battery the distance between the plates of the capacitor is increased using an insulating handle. As a result the potential difference between the plates

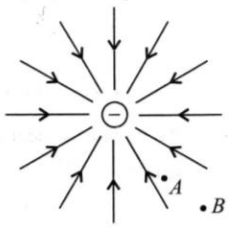
(a) increases (b) decreases (c) does not change (d) becomes zero

32. Figure shows the field lines of a positive point charge. The work done by the field in moving a small positive charge from Q to P is



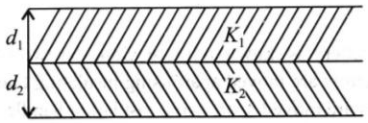
(a) zero
(b) positive
(c) negative
(d) data insufficient

33. Figure shows the field lines of a point negative charge. In going from B to A, the kinetic energy of a small negative charge will



(a) increase
(b) decrease
(c) remains constant
(d) data insufficient

34. A parallel plate capacitor is made of two dielectric blocks in series. One of the blocks has thickness d_1 and of dielectric constant K_1 and the other has thickness d_2 and dielectric constant K_2 as shown in figure. This arrangement can be thought as a dielectric slab of thickness $d\ (= d_1 + d_2)$ and effective dielectric constant K. The K is



(a) $\dfrac{K_1d_1 + K_2d_2}{d_1 + d_2}$ (b) $\dfrac{K_1d_1 + K_2d_2}{K_1 + K_2}$ (c) $\dfrac{K_1K_2(d_1 + d_2)}{K_2d_1 + K_1d_2}$ (d) $\dfrac{2K_1K_2}{K_1 + K_2}$

35. A parallel plate capacitor is filled by a dielectric whose relative permittivity varies with the applied voltage (V) as $\varepsilon = \alpha V$ where $\alpha = 2\ V^{-1}$. A similar capacitor with no dielectric is charged to $V_o = 78$ V. It is then connected to the uncharged capacitor with the dielectric. Final voltage on the capacitor is

(a) 2 V (b) 3 V (c) 5 V (d) 6 V

36. A system consists of two charges 4 μC and −3 μC with no external field placed at (−5 cm, 0, 0) and (5 cm, 0, 0) respectively. The amount of work required to separate the two charges infinitely away from each other is

(a) −1.1 J (b) 2 J (c) 2.5 J (d) 3 J

37. A capacitor is made of two circular plates of radius R each, separated by a distance $d << R$. The capacitor is connected to a constant voltage. A thin conducting disc of radius $r << R$ and thickness $t << r$ is placed at the centre of the bottom plate. Find the minimum voltage required to lift the disc if the mass of the disc is m.

(a) $\dfrac{\sqrt{mgd}}{\pi\varepsilon_o r^2}$ (b) $\sqrt{\dfrac{mgd}{\pi\varepsilon_o r}}$ (c) $\sqrt{\dfrac{mgd^2}{\pi\varepsilon_o r^2}}$ (d) $\sqrt{\dfrac{mgd}{\pi\varepsilon_o r^2}}$

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

(a) $\dfrac{C}{4}\left(V_1^2 - V_2^2\right)$ (b) $\dfrac{C}{4}\left(V_1^2 + V_2^2\right)$ (c) $\dfrac{C}{4}(V_1 - V_2)^2$ (d) $\dfrac{C}{4}(V_1 + V_2)^2$

39. Which of the following statements is false for a perfect conductor?

(a) The surface of the conductor is an equipotential surface.
(b) The electric field just outside the surface of a conductor is perpendicular to the surface.
(c) The charge carried by a conductor is always uniformly distributed over the surface of the conductor.
(d) None of these

40. The number of ways one can arrange three identical capacitors to obtain distinct effective capacitances is
(a) 8 (b) 6 (c) 4 (d) 3

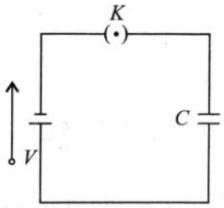
41. Consider two conducting spheres of radii R_1 and R_2 with $R_1 > R_2$. If the two are at the same potential, and the larger sphere has more charge than the smaller sphere, then
(a) the charge density of smaller sphere is less than that of larger sphere.
(b) the charge density of smaller sphere is more than that of larger sphere.
(c) both spheres may have same charge density.
(d) None of these.

42. Equipotential surfaces
(a) are closer in regions of large electric fields compared to regions of lower electric fields
(b) will be more crowded near sharp edges of a conductor
(c) will always be equally spaced
(d) both (a) and (b) are correct

43. An infinite cylinder of radius r_0, carrying linear charge density λ. The equation of the equipotential surface for this cylinder is
(a) $r = r_o e^{\pi\varepsilon_o}[V(r)+V(r_o)]\lambda$ (b) $r = r_o e^{2\pi\varepsilon_o}[V(r)-V(r_o)]\lambda^2$
(c) $r = r_o e^{-2\pi\varepsilon_o}[V(r)-V(r_o)]/\lambda$ (d) $r = r_o e^{-2\pi\varepsilon_o}[V(r)-V(r_o)]\lambda$

44. A spherical capacitor has an inner sphere of radius 10 cm and an outer sphere of radius 11 cm. The outer sphere is earthed and the inner sphere is given a charge of 3.2 μC. The space between the concentric sphere is filled with a liquid of dielectric constant 28. The capacitance of capacitor is
(a) 2×10^{-9} F (b) 3.4×10^{-9} F (c) 4.1×10^{-9} F (d) 5.2×10^{-9} F

45. A parallel plate capacitor is connected to a battery as shown in figure. Consider two situations
(i) key K is kept closed and plates of capacitors are moved apart using insulating handle
(ii) key K is opened and plates of capacitors are moved apart using insulating handle.



Which of the following statements is correct?
(a) In (i), Q remains same but C changes. (b) In (ii) V remains same but C changes.
(c) In (i) V remains same and hence Q changes. (d) In (ii) both Q and V changes.

46. A test charge is moved from lower potential point to a higher potential point. The potential energy of test charge will
(a) remains the same (b) increase (c) decrease (d) becomes zero

47. Which among the following is an example of polar molecule?
(a) O_2 (b) H_2 (c) N_2 (d) HCl

48. Two metal spheres, one of radius R and the other of radius $2R$, both have same surface charge density σ. If they are brought in contact and separated, then the new surface charge densities on each of the sphere are respectively
(a) $\frac{5}{2}\sigma, \frac{5}{4}\sigma$ (b) $\frac{5}{3}\sigma, \frac{5}{6}\sigma$ (c) $\frac{3}{5}\sigma, \frac{6}{5}\sigma$ (d) $\frac{2}{3}\sigma, \frac{1}{2}\sigma$

49. Which of the following statement is true about the relation between electric field and potential?
(a) Electric field is in the direction in which the potential decreases steepest
(b) Magnitude of electric field is given by the change in the magnitude of potential per unit displacement normal to the equipotential surface at that point.
(c) In the region of strong electric field, equipotential surfaces are far apart.
(d) Both the statements (a) and (b) are correct.

50. An electric dipole of length 20 cm having $\pm 3 \times 10^{-3}$ C charge placed at 60° with respect to a uniform electric field experiences a torque of magnitude 6 N m. The potential energy of the dipole is
(a) $-2\sqrt{3}$ J (b) $5\sqrt{3}$ J (c) $-3\sqrt{2}$ J (d) $3\sqrt{5}$ J

51. The distance between H^+ and Cl^- ions in HCl molecules is 1.38 Å. The potential due to this dipole at a distance of 10 Å on the axis of dipole is
(a) 2.1 V (b) 1.8 V (c) 0.2 V (d) 1.2 V