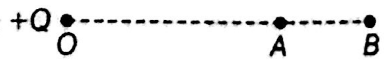
DCAM classes
Dynamic Classes for Academic Mastery

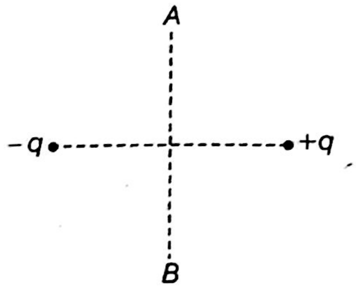
Electrostatic potential and capacitance:CBSE

1 Mark Questions

1. Draw equipotential surfaces for an electric dipole.
2. Draw the equipotential surfaces due to an isolated point charge
3. Does the charge given to a metallic sphere depend on whether it is hollow or solid? Give reason for your answer.
4. A point charge $+Q$ is placed at point O as shown in the figure. Is the potential difference $(V_A - V_B)$ positive, negative or zero?



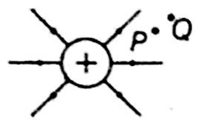
5. A charge q is moved from a point A above a dipole of dipole moment p to a point B below the dipole in equatorial plane without acceleration. Find the work done in this process.



6. Why are electric field lines perpendicular at a point on an equipotential surface of a conductor?

7. Two point charges q and $-2q$ are kept d distance apart. Find the location of point relative to charge q at which potential due to this system of charges is zero.

8. The figure shows the field lines of a positive charge. Is the work done by the field is moving a small positive charge from Q to P positive or negative?



9. For any charge configuration, equipotential surface through a point is a normal to the electric field. Justify.

10. What is the geometrical shape of equipotential surfaces due to a single isolated charge?

11. What is the amount of work done in moving a point charge around a circular arc of radius r at the centre of which another point charge is located?

12. Two charges $2\,\mu C$ and $-2\,\mu C$ are placed at points A and B, 5 cm apart. Depict an equipotential surface of the system.

13. Why electrostatic potential is constant throughout the volume of the conductor and has the same value as on its surface?

14. Why the potential inside a hollow spherical charged conductor is constant and has the same value as on its surface?

15. Why there is no work done in moving a charge from one point to another on an equipotential surface?

16. A hollow metal sphere of radius 5 cm is charged such that potential on its surface is 10V. What is the potential at the centre of the sphere?

17. Can two equipotential surface intersect each other? Justify your answer.

18. Draw equipotential surfaces due to a single point charge.

19. Name the physical quantity whose SI unit is JC^{-1}. Is it a scalar or a vector quantity?

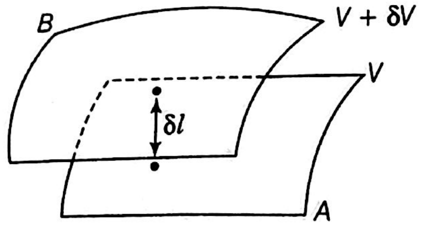
2 Marks Questions

20. (a) Draw equipotential surfaces corresponding to the electric field that uniformly increases in magnitude along with the z-directions.
    (b) Two charges $-q$ and $+q$ are located at points $(0, 0, -a)$ and $(0, 0, a)$. What is the electrostatic potential at the points $(0, 0, \pm z)$ and $(x, y, 0)$?

21. (a) Draw the equipotential surfaces due to an electric dipole.
    (b) Derive an expression for the electric field due to a dipole of dipole moment **p** at a point on its perpendicular bisector.

22. Two point charges q_1 and q_2 are located at r_1 and r_2, respectively in an external electric field **E**. Obtain the expression for the total work done in assembling this configuration.

23. Two closely spaced equipotential surfaces A and B with potentials V and $V+\delta V$, (where δV is the change in V) are kept δl distance apart as shown in the figure. Deduce the relation between the electric field and the potential gradient between them. Write the two important conclusions concerning the relation between the electric field and electric potential.

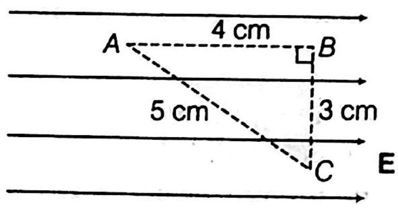


24. Calculate the amount of work done to dissociate a system of three charges, two of 1μC and one of −4μC placed on the vertices of an equilateral triangle of side 10 cm.

25. A test charge q is moved without acceleration from A to C along the path from A to B and then from B to C in electric field **E** as shown in the figure.

(i) Calculate the potential difference, between A and C.

(ii) At which point (of the two), the electric potential is more and why?



26. Draw a plot showing the variation of (i) electric field (E) and (ii) electric potential (V) with distance r due to a point charge Q.

27. Two uniformly large parallel thin plates having charge densities $+\sigma$ and $-\sigma$ are kept in the XZ- plane at a distance d apart. Sketch an equipotential surface due to electric field between the plates. If a particle of mass m and charge $-q$ remains stationary between the plates. What is the magnitude and direction of this field?

28. Two point charges 3 μC and −3 μC are placed at points A and B, 5 cm apart.

(i) Draw the equipotential surfaces of the system.

(ii) Why do equipotential surfaces get close to each other near the point charge?

29. Two charged conducting spheres of radii r_1 and r_2 connected to each other by a wire. Find the ratio of electric fields at the surfaces of the two spheres.

30. A dipole with its charge $-q$ and $+q$ located at the points $(0,-b,0)$ and $(0,+b,0)$ is present in a uniform electric field **E**. The equipotential surfaces of this field are planes parallel to the YZ-plane.

(i) What is the direction of the electric field **E**?

(ii) How much torque would the dipole experience in this field?

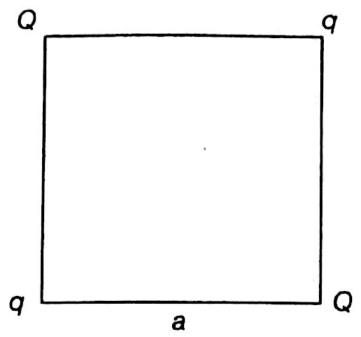
31. Find out the expression for the potential energy of a system of three charges q_1, q_2 and q_3 located at r_1, r_2 and r_3 with respect to the common origin O.

3 Marks Questions

32. (a) Draw the equipotential surfaces corresponding to a uniform electric field in the z-direction.

(b) Derive an expression for the electric potential at any point along the axial line of an electric dipole.

33. Four point charges Q, q, Q and q are placed at the corners of a square of side a as shown in figure.

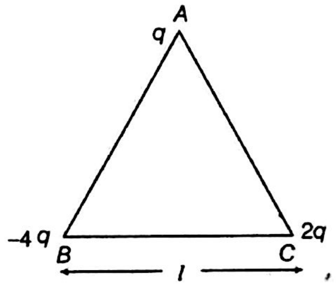


Find the

(a) resultant electric force on a charge Q and

(b) potential energy of this system.

34. (a) Three point charges q, $-4q$ and $2q$ are placed at the vertices of an equilateral triangle ABC of side l as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.



(b) Find out the amount of the work done to separate the charges at infinite distance.

35. (i) Derive the expression for the electric potential due to an electric dipole at a point on its axial line.

(ii) Depict the equipotential surfaces due to an electric dipole.

36. Define an equipotential surface. Draw equipotential surfaces

(i) in case of a single point charge

(ii) in a constant electric field in Z-direction. Why the equipotential surfaces about a single charge are not equidistant?

(iii) Can electric field exist tangential to an equipotential surface? Give reason.

37. (i) Depict the equipotential surfaces for a system of two identical positive point charges placed a distance d apart.

(ii) Deduce the expression for the potential energy of a system of two point charges q_1 and q_2 brought from infinity to the points with positions $\mathbf{r}_1$ and $\mathbf{r}_2$ respectively, in presence of external electric field E.

5 Marks Question

38. Two point charges q and $-q$ are located at points $(0,0,-a)$ and $(0,0,a)$ respectively.

(a) Find the electrostatic potential at $(0,0,z)$ and $(x,y,0)$.

(b) How much work is done in moving a small test charge from the point (5,0,0) to (−7,0,0) along the X-axis?

(c) How would your answer change if the path of the test charge between the same points is not along the X-axis but along any other random path?

(d) If the above point charges are now placed in the same positions in a uniform external electric field $\mathbf{E}$, what would be the potential energy of the charge system in its orientation of unstable equilibrium?

Justify your answer in each case

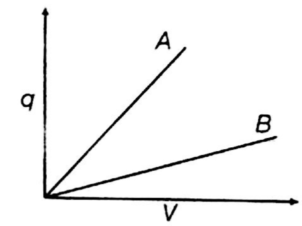
PREVIOUS YEARS' EXAMINATION QUESTIONS

TOPIC 2

1 Mark Questions

1. Why does current in steady state not flow in a capacitor connected across a battery? However, momentary current does flow during charging or discharging of the capacitor. Explain.

2. The given graph shows the variation of charge q *versus* potential difference V for two capacitors C_1 and C_2. Both the capacitors have same plate separation but plate area of C_2 is greater than that C_1. Which line (A or B) corresponds to C_1 and why?



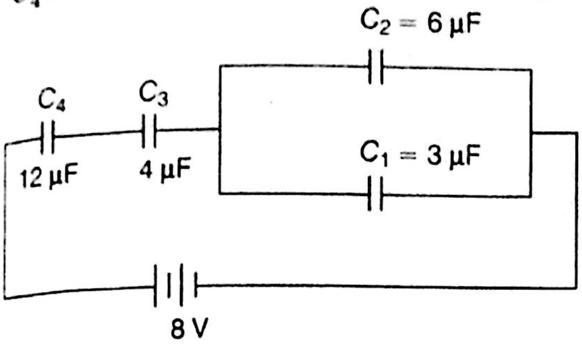
3. Distinguish between a dielectric and a conductor.

4. Define the dielectric constant of a medium. What is its unit?

2 Marks Questions

5. A 100 μF parallel plate capacitor having plate separation of 4 mm is charged by 200 V DC. The source is now disconnected. When the distance between the plates is doubled and a dielectric slab of thickness 4 mm and dielectric constant 5 is introduced between the plates, how will (i) its capacitance, (ii) the electric field between the plates and (iii) energy density of the capacitor get affected? Justify your answer in each case.

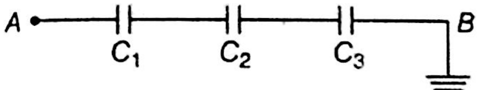
6. In a network, four capacitors C_1, C_2, C_3 and C_4 are connected as shown in the figure.



(a) Find the net capacitance of the circuit.

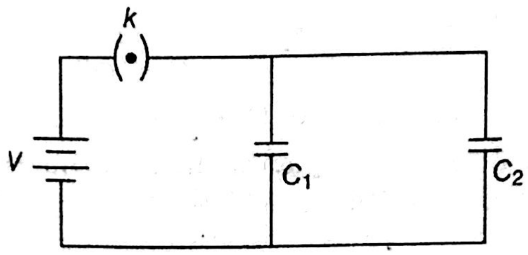
(b) If the charge on the capacitor C_1 is $6\mu C$, (i) calculate the charge on the capacitors C_3 and C_4 and (ii) net energy stored in the capacitors C_3 and C_4 connected in series.

7. Calculate the potential difference and the energy stored in the capacitor C_2 in the circuit shown in the figure. Given potential at A is 90 V, $C_1 = 20\mu$ F, $C_2 = 30\mu$ F and $C_3 = 15\mu F$.



8. A parallel plate capacitor of capacitance C is charged to a potential V. It is then connected to another uncharged capacitor having the same capacitance. Find out the ratio of the energy stored in the combined system to that stored initially in the single capacitor.

9. Two parallel plate capacitors of capacitances C_1 and C_2 such that $C_1 = 2C_2$ are connected across a battery of V volt as shown in the figure. Initially, the key (k) is kept closed to fully charge the capacitors.



The key is now thrown open and a dielectric slab of dielectric constant K is inserted in the two capacitors to completely fill the gap between the plates. Find the ratio of

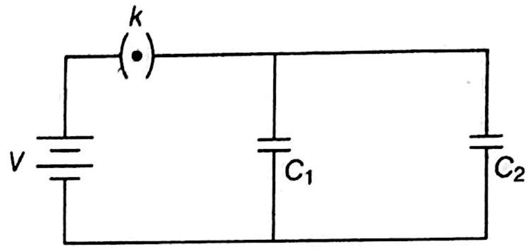
(i) the net capacitance and

(ii) the energies stored in the combination before and after the introduction of the dielectric slab.

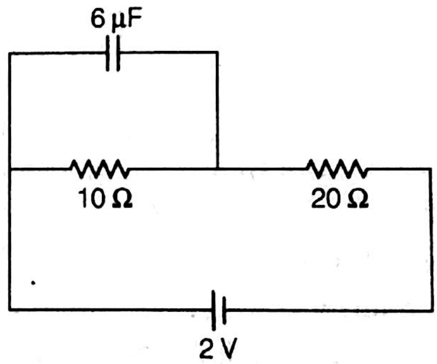
10. Two parallel plate capacitors of capacitances C_1 and C_2 such that $C_1 = C_2 / 2$ are connected across a battery of V volts as shown in the figure. Initially, the key (k) is kept closed to fully charge the capacitors. The key is now thrown open and a dielectric slab of dielectric constant K is inserted in the two capacitors to completely fill the gap between the plates. Find the ratio of

(i) the net capacitance and

(ii) the energies stored in the combination before and after the introduction of the dielectric slab.

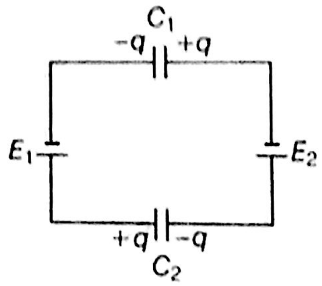


11. Find the charge on the capacitor as shown in the circuit.



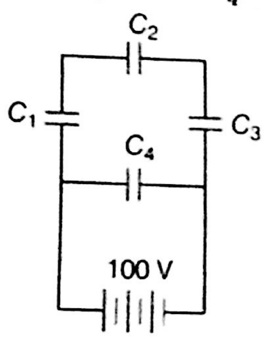
12. A slab of material of dielectric constant K has the same area as that of the plates of a parallel plate capacitor, but has the thickness $d/2$, where d is the separation between the plates. Find out the expression for its capacitance when the slab is inserted between the plates of the capacitor.

13. Determine the potential difference across the plates of the capacitor C_1 of the network shown in the figure. (assume, $E_2 > E_1$)



14. A parallel plate capacitor, each of plate area A and separation d between the two plates, is charged with charges $+Q$ and $-Q$ on the two plates. Deduce the expression for the energy stored in capacitor.

15. A network of four capacitors, each of capacitance 15μF, is connected across a battery of 100 V, as shown in the figure. Find the (i) net capacitance and (ii) the charge on the capacitor C_4.



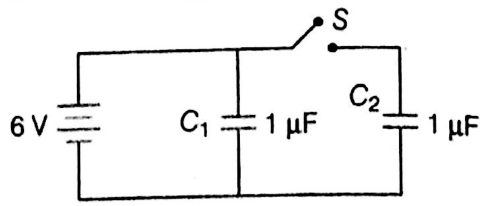
16. Deduce the expression for the electrostatic energy stored in a capacitor of capacitance C and having charge Q.

How will the

(i) energy stored and

(ii) the electric field inside the capacitor be affected when it is completely filled with a dielectric material of dielectric constant K?

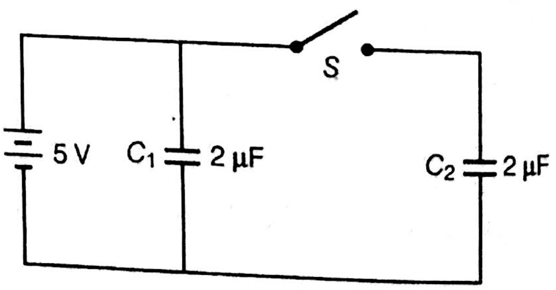
17. Two capacitors of 1 μF capacitance are connected to a battery of 6 V. Initially switch S is closed. After sometime S is left open and dielectric slab of dielectric constant $K = 3$ are inserted to fill completely the space between the plates of the two capacitors. How will the (i) charge and (ii) potential difference between the plates of the capacitors be affected after the slabs are inserted?



18. Net capacitance of three identical capacitors in series is 1 μF. What will be their net capacitance, if connected in parallel?

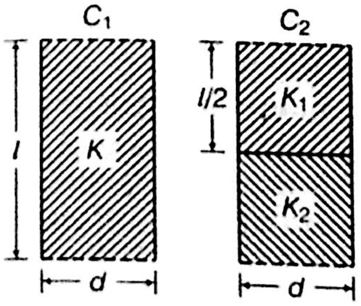
Find the ratio of energy stored in these two configurations, if they are both connected to the same source.

19. Figure shows two identical capacitors C_1 and C_2, each of 2 μF capacitance, connected to a battery of 5 V. Initially, switch S is closed. After sometime, S is left open and dielectric slabs of dielectric constant $K = 5$ are inserted to fill completely the space between the plates of the two capacitors. How will the (i) charge and (ii) potential difference between the plates of the capacitors be affected after the slabs are inserted?

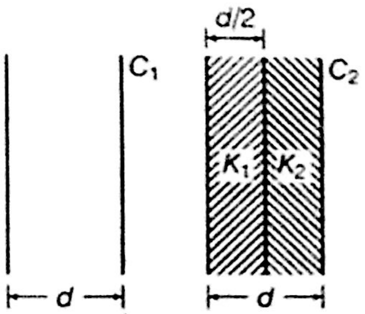


20. What is the area of the plates of 2 F parallel plate capacitor having separation between the plates is 0.5 cm?

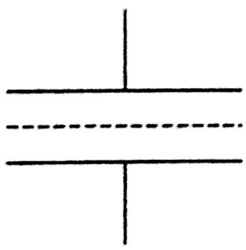
21. Two identical parallel plate (air) capacitors C_1 and C_2 have capacitance C each. The space between their plates is now filled with dielectrics as shown in the figure. If the two capacitors still have equal capacitance, then obtain the relation between dielectric constants K, K_1 and K_2.



22. You are given an air filled parallel plate capacitor C_1. The space between its plates is now filled with slabs of dielectric constants K_1 and K_2 as shown in figure. Find the capacitance of the capacitor C_2 if area of the plates is A and distance between the plates is d.



23. Figure shows a sheet of aluminium foil of negligible thickness placed between the plates of a capacitor. How will its capacitance be affected, if



(i) the foil is electrically insulated?

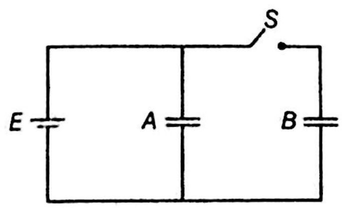
(ii) the foil is connected to the upper plate with a conducting wire?

24. Distinguish between polar and non-polar dielectric.

3 Marks Questions

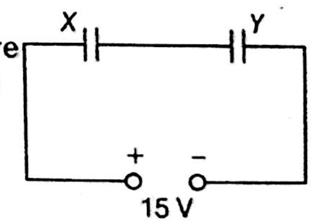
25. A 200 μF parallel plate capacitor having plate separation of 5 mm is charged by a 100 V DC source. It remains connected to the source. Using an insulated handle, the distance between the plates is doubled and a dielectric slab of thickness 5 mm and dielectric constant 10 is introduced between the plates. Explain with reason, how the (i) capacitance, (ii) electric field between the plates and (iii) energy density of the capacitor will change.

26. Two identical parallel plate capacitors A and B are connected to a battery of V volts with the switch S is closed. The switch is now opened and the free space between the plates of the capacitors is filled with a dielectric of dielectric constant K. Find the ratio of the total electrostatic energy stored in both capacitors before and after the introduction of the dielectric.



27. A 12 pF capacitor is connected to a 50 V battery. How much electrostatic energy is stored in the capacitor? If another capacitor of 6 pF is connected in series with it with the same battery connected across the combination, find the charge stored and potential difference across each capacitor.

28. Two parallel plate capacitors X and Y have the same area of plates and same separation between them, X has air between the plates while Y contains a dielectric medium of $\varepsilon_r = 4$.

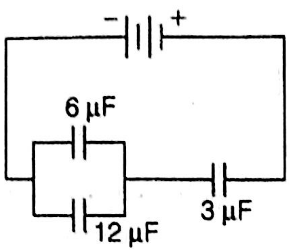


(i) Calculate the capacitance of each capacitor, if equivalent capacitance of the combination is 4μF.

(ii) Calculate the potential difference between the plates of X and Y.

(iii) Estimate the ratio of electrostatic energy stored in X and Y.

29. In the following arrangement of capacitors, the energy stored in the 6μF capacitor is E.



Find the value of the following

(i) energy stored in 12μF capacitor

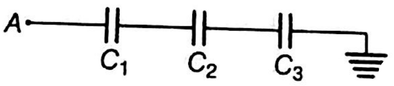
(ii) energy stored in 3μF capacitor

(iii) total energy drawn from the battery

30. Find the ratio of the potential differences that must be applied across the parallel and series combination of two capacitors C_1 and C_2 with their capacitances in the ratio 1 : 2, so that the energy stored in these two cases becomes the same.

31. Two capacitors of unknown capacitances C_1 and C_2 are connected first in series and then in parallel across a battery of 100 V. If the energy stored in the two combinations is 0.045 J and 0.25 J respectively, then determine the value of C_1 and C_2. Also, calculate the charge on each capacitor in parallel combination.

32. Calculate the potential difference and the energy stored in the capacitor C_2 in the circuit shown in the figure. Given potential at A is 90 V, $C_1 = 20\mu F$, $C_2 = 30\ \mu F$ and $C_3 = 15\mu F$.



33. (i) Obtain the expression for the energy stored per unit volume in a charged parallel plate capacitor.

(ii) The electric field inside a parallel plate capacitor is E. Find the amount of work done in moving a charge q over a closed rectangular loop.

34. (i) Derive the expression for the capacitance of a parallel plate capacitor having plate area A and plate separation d.

(ii) Two charged spherical conductors of radii R_1 and R_2 when connected by a conducting plate respectively. Find the ratio of their surface charge densities in terms of their radii.

35. In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3}\ m^2$ and the separation between the plate is 3 mm.

(i) Calculate the capacitance of the capacitor.

(ii) If this capacitor is connected to 100 V supply, what would be the charge on each plate?

(iii) How would charge on the plates be affected if a 3 mm thick mica sheet of $K = 6$ is inserted between the plates while the voltage supply remains connected?

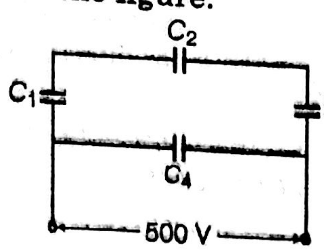
36. A capacitor of unknown capacitance is connected across a battery of V volt. The charge stored in it is 360μC. When potential across the capacitor is reduced by 120 V, the charge stored in it becomes 120 μC. Calculate

(i) the potential V and the unknown capacitance C.

(ii) what will be the charge stored in the capacitor, if the voltage applied had increased by 120 V?

37. A capacitor of 200 pF is charged by a 300 V battery. The battery is then disconnected and the charged capacitor is connected to another uncharged capacitor of 100 pF. Calculate the difference between the final energy stored in the combined system and the initial energy stored in the single capacitor.

38. A network of four capacitors each of 12μF capacitance, if connected to a 500V supply as shown in the figure.



Determine

(i) the equivalent capacitance of the network and

(ii) the charge on each capacitor.

39. A parallel plate capacitor is charged by a battery. After sometime, the battery is disconnected and a dielectric slab with its thickness equal to the plate separation is inserted between the plates. How will

(i) the capacitances of the capacitor,

(ii) potential difference between the plates and

(iii) the energy stored in the capacitors be affected? Justify your answer in each case.

40. A parallel plate capacitor, each with plate area A and separation d is charged to a potential difference V. The battery used to charge it remains connected. A dielectric slab of thickness d and dielectric constant K is now placed between the plates. What change if any will take place in

(i) charge on plates?

(ii) electric field intensity between the plates?

(iii) capacitance of the capacitor?

Justify your answer in each case.

41. A parallel plate capacitor is charged to a potential difference V by a DC source. The capacitor is then disconnected from the source. If the distance between the plates is doubled, state with reason, how the following will change?

(i) Electric field between the plates

(ii) Capacitance

(iii) Energy stored in the capacitor.

42. Show that the capacitance of a spherical conductor is $4\pi\varepsilon_0$ times the radius of the spherical conductor.

43. Find the ratio of the potential differences that must be applied across the parallel and the series combination of two identical capacitors, so that the energy stored in the two cases becomes the same.

44. (i) How is the electric field due to a charged parallel plate capacitor affected when a dielectric slab is inserted between the plates fully occupying the intervening region?

(ii) A slab of material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has thickness $\frac{1}{2}d$, where d is the separation between the plates. Find the expression for the capacitance when the slab is inserted between the plates.

45. (i) Plot a graph comparing the variation of potential V and electric field E due to a point charge Q as a function of distance R from the point charge.

(ii) Find the ratio of the potential differences that must be applied across the parallel and the series combination of two capacitors, C_1 and C_2 with their capacitances in the ratio 1 : 2, so that the energy stored in the two cases becomes the same.

5 Marks Questions

46. (a) Describe briefly the process of transferring the charge between the two plates of a parallel plate capacitor when connected to a battery. Derive an expression for the energy stored in a capacitor.

(b) A parallel plate capacitor is charged by a battery to a potential difference V. It is disconnected from battery and then connected to another uncharged capacitor of the same capacitance. Calculate the ratio of the energy stored in the combination to the initial energy on the single capacitor.

47. A capacitor of capacitance C_1 is charged to a potential V_1 while another capacitor of capacitance C_2 is charged to a potential difference V_2. The capacitors are now disconnected from their respective charging batteries and connected in parallel to each other.

(a) Find the total energy stored in the two capacitors before they are connected.

(b) Find the total energy stored in the parallel combination of the two capacitors.

(c) Explain the reason for the difference of energy in parallel combination in comparison to the total energy before they are connected.

48. (i) If two similar large plates, each of area A having surface charge densities $+\sigma$ and $-\sigma$ are separated by a distance d in air, find the expression for

(a) field at points between the two plates and on outer side of the plates. Specify the direction of the field in each case.

(b) the potential difference between the plates.

(c) the capacitance of the capacitor so formed.

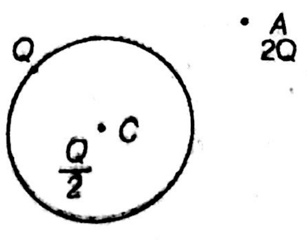
(ii) Two metallic spheres of radii R and $2R$ are charged, so that both of these have same surface charge density σ. If they are connected to each other with a conducting wire, in which direction will the charge flow and why?

49. (i) Explain using suitable diagrams, the difference in the behaviour of a

(a) conductor and

(b) dielectric in the presence of external electric field. Define the terms polarisation of a dielectric and write its relation with susceptibility.

(ii) A thin metallic spherical shell of radius R carries a charge Q on its surface. A point charge $Q/2$ is placed at its centre C and an other charge $+2Q$ is placed outside the shell at a distance x from the centre as shown in the figure.



Find

(a) the force on the charge at the centre of shell and at the point A,

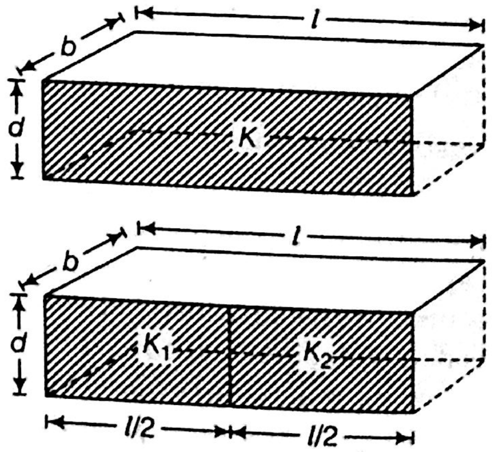
(b) the electric flux through the shell.

50. (i) Derive the expression for the energy stored in parallel plate capacitor. Hence, obtain the expression for the energy density of the electric field.

(ii) A fully charged parallel plate capacitor is connected across an uncharged identical capacitor. Show that the energy stored in the combination is less than the energy stored initially in the single capacitor.

51. (i) Obtain the expression for the potential due to an electric dipole of dipole moment P at a point r on the axial line.

(ii) Two identical capacitors of plate dimensions $l \times b$ and plate separation d have dielectric slabs filled in between the space of the plates as shown in the figure.



Obtain the relation between dielectric constants K, K_1 and K_2.

52. (i) A parallel plate capacitor is charged by a battery to a potential. The battery is disconnected and a dielectric slab is inserted to completely fill the space between the plates.

How will
(a) its capacitance
(b) electric field between the plates and
(c) energy stored in the capacitor be affected? Justify your answer giving necessary mathematical expressions for each case.

(ii) (a) Draw the electric field lines due to a conducting sphere.
(b) Draw the electric field lines due to a dipole.

53. (i) Deduce the expression for the energy stored in a charged capacitor.
(ii) Show that the effective capacitances C of a series combination of three capacitors C_1 , C_2 and C_3 is given by

$$C = \frac{C_1 C_2 C_3}{C_1 C_2 + C_2 C_3 + C_3 C_1}.$$

Objective Questions

(For Complete Chapter)

1 Mark Questions

1. 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 $\dfrac{Q}{4\pi\varepsilon_0 R^2}$

   (b) $\dfrac{Q}{4\pi\varepsilon_0 R}$ and zero

   (c) $\dfrac{Q}{4\pi\varepsilon_0 R}$ and $\dfrac{Q}{4\pi\varepsilon_0 R^2}$

   (d) Both are zero

2. What is the electric potential at a distance of 9 cm from 3 nC?

   (a) 270 V (b) 3 V
   (c) 300 V (d) 30 V

3. Work done in carrying an electric charge Q_1 once round a circle of radius R with a charge Q_2 at the centre of the circle is

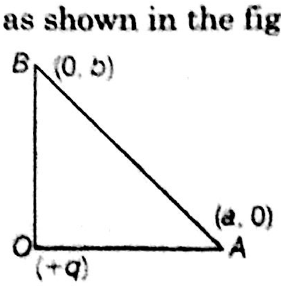
   (a) $\dfrac{Q_1Q_2}{4\pi\varepsilon_0 R}$ (b) ∞

   (c) $\dfrac{Q_1Q_2}{4\pi\varepsilon_0 R^2}$ (d) 0

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

   (a) maximum at A
   (b) maximum at B
   (c) maximum at C
   (d) same at all the three points A, B and C

5. A charge $+q$ is placed at the origin O of xy- axis as shown in the figure.



   The work done in taking a charge Q from A to B along the straight line AB is

   (a) $\dfrac{qQ}{4\pi\varepsilon_0}\left(\dfrac{a-b}{ab}\right)$ (b) $\dfrac{qQ}{4\pi\varepsilon_0}\left(\dfrac{b-a}{ab}\right)$

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

6. A charge Q is placed at the origin. The electric potential due to this charge at a given point in space is V. The work done by an external force in bringing another charge q from infinity upto the point is

   (a) V/q (b) Vq (c) $V+q$ (d) V

7. A hollow metal sphere of radius 10 cm is charged such that the potential on its surface becomes 80 V. The potential at the centre of the sphere is

   (a) 80 V (b) 800 V (c) 8 V (d) zero

8. Which of the following is not true?

   (a) For a point charge, the electrostatic potential varies as $1/r$
   (b) For a dipole, the potential depends on the position vector and dipole moment vector
   (c) The electric dipole potential varies as $1/r$ at large distance
   (d) For a point charge, the electrostatic field varies as $1/r^2$

9. The potential of an electric dipole vary with distance r as

   (a) $\dfrac{1}{r}$ (b) $\dfrac{1}{r^3}$

   (c) $\dfrac{1}{r^4}$ (d) $\dfrac{1}{r^2}$

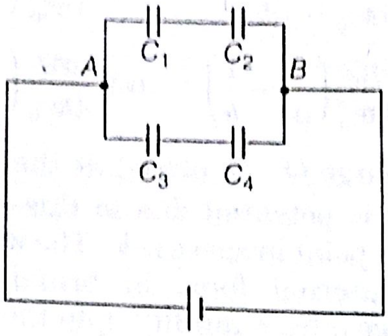
10. What is not true for equipotential surface for uniform electric field?

    (a) Equipotential surface is flat
    (b) Two equipotential surfaces can cross each other
    (c) Electric lines are perpendicular to equipotential surface
    (d) Work done is zero

11. The capacity of an isolated conducting sphere of radius R is proportional to

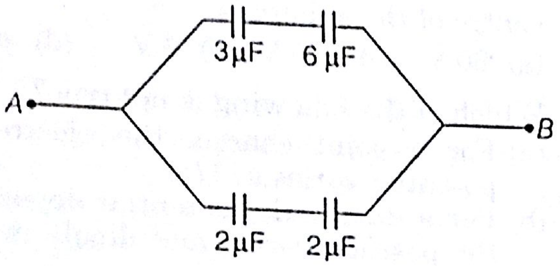
    (a) R^2 (b) $\dfrac{1}{R^2}$ (c) $\dfrac{1}{R}$ (d) R

12. Effective capacitance between A and B in the figure shown below is
($C_1 = C_2 = 20\,\mu F, C_3 = C_4 = 10\,\mu F$)



(a) $10\,\mu F$ (b) $15\,\mu F$ (c) $20\,\mu F$ (d) $25\,\mu F$

13. The equivalent capacitance between points A and B in the given figure, is



(a) $\frac{36}{13\,\mu F}$ (b) $2\,\mu F$ (c) $1\,\mu F$ (d) $3\,\mu F$

14. A capacitor of capacitance C has charge Q and stored energy is W. If the charge is increased to $2Q$, the stored energy will be

(a) $\frac{W}{4}$ (b) $\frac{W}{2}$

(c) $2W$ (d) $4W$