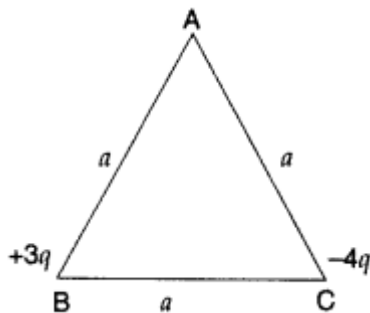


1. Which orientation of an electric dipole in a uniform electric field would correspond to stable equilibrium ?
2. If the radius of the Gaussian surface enclosing a charge is halved, how does the electric flux through the Gaussian surface change
3. Why should electrostatic field be zero inside a conductor?
4. Why must electrostatic field be normal to the surface at every point of a charged conductor?
5. A charge 'q' is placed at the centre of a cube of side l. What is the electric flux passing through each face of the cube?
6. State Gauss' law in electrostatics. Using this law derive an expression for the electric field due to a uniformly charged infinite plane sheet.
7. A positive point charge (+ q) is kept in the vicinity of an uncharged conducting plate. Sketch electric field lines originating from the point on to the surface of the plate. Derive the expression for the electric field at the surface of a charged conductor.
8. Calculate the flux of the uniform field through a square surface of area 10 cm^2 when
 - (i) its plane is parallel to the y-z plane, and
 - (ii) the normal to its plane makes a 60° angle with the x-axis.
9. Two charged spherical conductors of radii R_1 and R_2 when connected by a conducting wire acquire charges q_1 and q_2 respectively. Find the ratio of their surface charge densities in terms of their radii.
10. Two point charges $+3q$ and $-4q$ are placed at the vertices 'B' and 'C' of an equilateral triangle ABC of side 'a' as given in the figure. Obtain the expression for



- (i) the magnitude and
 - (ii) the direction of the resultant electric field at the vertex A due to these two charges.
11. Four charges of $-2q$, q , $-q$ and $2q$ are at the corners of a square ABCD ,of side 20 cm , find the magnitude and the direction of the electric field at the centre of the square. Take $q = 5 \text{ mc}$
 12. A point charge causes an electric flux of $-1.0 \times 10^3 \text{ Nm}^2 \text{ C}^{-1}$ 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 value of the point charge?

13. A conducting sphere of radius 10 cm has an unknown charge. If the electric field 20 cm from the centre of the sphere is $1.5 \times 10^3 \text{ N C}^{-1}$ and points radially inward. What is the net charge on the sphere?
14. An oil drop of 12 excess electrons is held stationary under a constant electric field of $2.55 \times 10^4 \text{ N C}^{-1}$ in Millikan's oil drop experiment. The density of the oil is 1.26 g cm^{-3} . Estimate the radius of the drop.
($g = 9.81 \text{ m s}^{-2}$; $e = 1.6 \times 10^{-19} \text{ C}$)
15. (a) Two insulated charged copper spheres A and B have their centres separated by a distance of 50 cm. What is the mutual force of electrostatic repulsion if the charge on each is $6.5 \times 10^{-7} \text{ C}$? The radii of A and B are negligible compared to the distance of separation.
(b) What is the force of repulsion if each sphere is charged double the above amount, and the distance between them is halved?
16. An infinite line charge produces a field of $9 \times 10^4 \text{ N/C}$ at a distance of 2cm. Calculate the linear charge density.
17. Four point charges $q_A = 2 \mu\text{C}$, $q_B = -5 \mu\text{C}$, $q_C = 2 \mu\text{C}$, and $q_D = -5 \mu\text{C}$ are located at the corners of a square ABCD of side 10 cm. What is the force on a charge of $1 \mu\text{C}$ placed at the centre of the square?
18. Three small identical conducting spheres have charges $-3 \times 10^{-12} \text{ C}$, $8 \times 10^{-12} \text{ C}$ and $4 \times 10^{-12} \text{ C}$ respectively. They are brought in contact and then separated. Calculate (i) charge on each sphere after separation (ii) number of electrons in excess or deficit on each sphere after separation .
19. A point charge $+q$ is placed at the origin. A second point charge $+9q$ is placed at $(d,0,0)$ in Cartesian coordinate system. The point in between them where the electric field vanishes is:
20. A hollow conducting sphere of radius 8cm is given a charge $16\mu\text{C}$. What is the electric field intensity i) at the centre of the sphere ii) on the outer surface of the sphere and iii) at a distance of 16cm from the centre of the sphere?