Class - 12 Physics (Electric Charges and Fields)

(Q1 to 10) – 1M

1. For a thin spherical shell of uniform surface charge density σ , The magnitude of $\vec{E}$ at a distance r, when r > R (radius of shell) is

   a. $E = \frac{4\pi R^2 \sigma}{4\pi\epsilon_0 r^3}$
   b. $E = \frac{4\pi R^2 \sigma}{4\pi\epsilon_0 r^2}$
   c. $E = \frac{R^2 \sigma}{4\pi\epsilon_0 r^2}$
   d. $E = \frac{4\pi R \sigma^2}{4\pi\epsilon_0 r^2}$

2. 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 6.5×10^{-7}C? The radii of A and B are negligible compared to the distance of separation.

3. A conducting sphere of radius 5 cm is charged to 15 μC. Another uncharged sphere of radius 10 cm is allowed to touch it for enough time. After the two are separated, the surface density of charge on the two spheres will be in the ratio

   a. 2:1
   b. 1:2
   c. 1:1
   d. 3:1

4. The unit of charge is

    a. volt
    b. ohm
    c. coulomb
    d. ampere

5. An electric dipole is

    a. a pair of electric charges of equal magnitude q but positive sign, separated by a distance d
    b. a pair of electric charges of equal magnitude q but opposite sign, separated by a distance
    c. a pair of electric charges of equal magnitude q but negative sign, separated by a distance d
    d. a pair of electric charges of equal magnitude q separated by a distance d

6. Which orientation of an electric dipole in a uniform electric field would correspond to stable equilibrium?

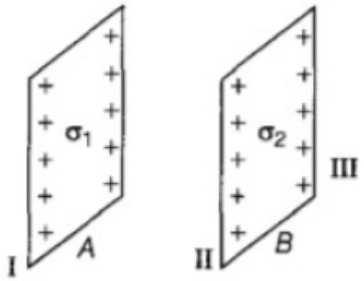
7. Is the mass of a body affected on charging?

8. Two point charges of $3\mu C$ each are 100 cm apart. At what point on the line joining the charges will the electric intensity be zero?

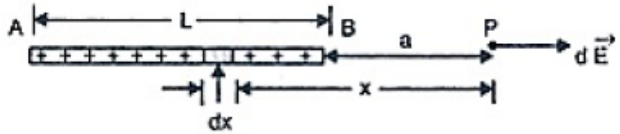
9. What is the basic cause of quantisation of charge?

10. Calculate the Coulomb force between 2α particles separated by $3.2 \times 10^{-15} m$.

11. Two infinitely large plane thin parallel sheets having surface charge densities σ_1 and σ_2 $(\sigma_1 > \sigma_2)$ are shown in the figure. Write the magnitudes and directions of the net fields in the regions marked II and III. 3M

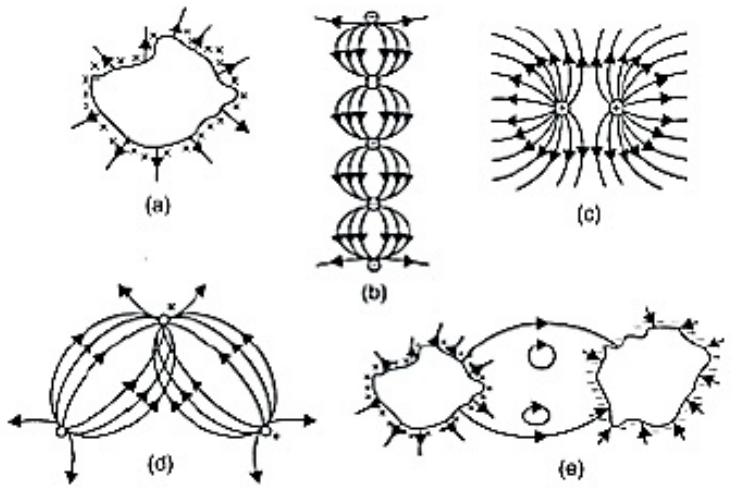


12. A thin insulating rod of length L carries a uniformly distributed charge Q. Find the electric field strength at a point along its axis at a distance 'a' from one end. 3M



13. The electrostatic force between charges of $200\mu C$ and $500\mu C$ placed in free space is 5 gf. Find the distance between the two charges. Take g = $10ms^{-2}$. 3M

14. Which among the curves shown in the figure cannot possibly represent electrostatic field lines? 1M



15. i. Define electric flux. Write its SI unit. Gauss' law in electrostatics is true for any closed surface, no matter what its shape or size is. Justify this statement with the help of a suitable example. 4M

ii. Use Gauss' law to prove that the electric field inside a uniformly charged spherical shell is zero.

16. An electric dipole is placed in a uniform electric field E with its dipole moment p parallel to the field. then find 3M

1. The work done in turning the dipole till its dipole moment points in the direction opposite to E.
2. The orientation of the dipole for which the torque acting on it becomes maximum.

17. Define the term electric dipole moment. Is it a scalar or vector? Deduce an expression for the electric field at a point on the equatorial plane of an electric dipole of length 2a. 4M

18. Define the term electric field intensity. Write its SI unit. Derive an expression for the electric field intensity at a point on the axis of an electric dipole. 4M