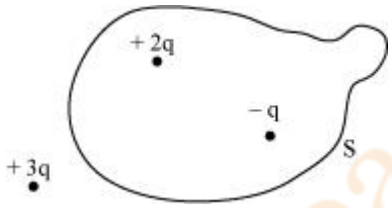
Electric Charges And Fields

Q.No.1:
Figure shows three point charges +2q, −q and + 3q. Two charges + 2q and −q are enclosed within a surface 'S'. What is the electric flux due to this configuration through the surface 'S'?



CBSE Board Paper 2010

Q.No.2:
In which orientation, a dipole placed in a uniform electric field is in (i) stable, (ii) unstable equilibrium?

CBSE Board Paper 2010

Q.No.3: Given a uniform electric filed $\vec{E} = 4 \times 10^3 \ \hat{i}\ \text{N/C}$. Find the flux of this field through a square of 5 cm on a side whose plane is parallel to the Y-Z plane. What would be the flux through the same square if the plane makes a 30° angle with the x-axis? **CBSE Board Paper 2014**

Q.No.4:
Define electric dipole moment. Write its S.I. unit.

CBSE Board Paper 2011

Q.No.5:

Plot a graph showing the variation of coulomb force (F) versus $\left(\frac{1}{r^2}\right)$, where *r* is the distance between the two charges of each pair of charges: (1 μC, 2 μC) and (2 μC, − 3 μC). Interpret the graphs obtained.

CBSE Board Paper 2011

Q.No.6:

A thin straight infinitely long conducting wire having charge density *λ* is enclosed by a cylindrical surface of radius *r* and length *l,* its axis coinciding with the wire.

(a) Find the expression for the electric flux through the surface of the cylinder.

(b) Find the expression for the electric field at a point on the surface of the cylinder.

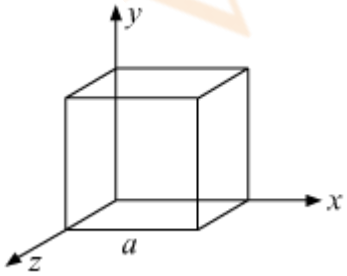
CBSE Board Paper 2011

Q.No.7: What is the electric flux through a cube of side 1 cm which encloses an electric dipole?

CBSE Board Paper 2015

Q.No.8: (a) An electric dipole of dipole moment $\vec{p}$ consists of point charges +*q* and −*q* separated by a distance 2*a* apart. Deduce the expression for the electric field $\vec{E}$ due to the dipole at a distance *x* from the centre of the dipole on its axial line in terms of the dipole moment $\vec{p}$. Hence show that in the limit $x >> a$, $\vec{E} \rightarrow 2\vec{p} / \left(4\pi \varepsilon_0 x^3\right)$.

(b) Given the electric field in the region $\vec{E} = 2x\hat{i}$, find the net electric flux through the cube and the charge enclosed by it.



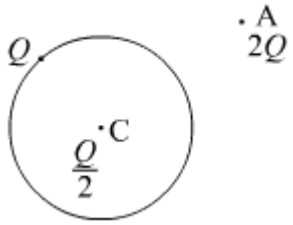
OR

(a) Explain, using suitable diagrams, the difference in the behaviour of a (i) conductor and (ii) dielectric in the presence of external electric field. Define the terms polarization of a dielectric and write its relation with susceptibility.

(b) A thin metallic spherical shell of radius *R* carries a charge *Q* on its surface. A

point charge $\frac{Q}{2}$ is placed at its centre C and an other charge +2*Q* is placed outside the shell at a distance *x* from the centre as shown in the figure. Find (i) the force on the charge at the centre of shell and at the point A, (ii) the electric flux through the shell.

CBSE Board Paper 2015



Q.No.9: How does the electric flux due to a point charge enclosed by a spherical Gaussian surface get affected when its radius is increased?

CBSE Board Paper 2016

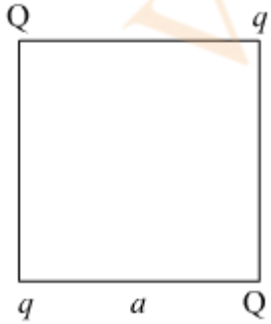
Q.No.10: A charge is distributed uniformly over a ring of radius '*a*'. Obtain an expression for the electric intensity *E* at a point on the axis of the ring. Hence, show that for points at large distance from the ring, it behaves like a point charge.

CBSE Board Paper 2016

Q.No.11: Obtain the expression for the torque $\vec{\tau}$ experienced by an electric dipole of dipole moment $\vec{p}$ in a uniform electric field, $\vec{E}$.

CBSE Board Paper 2017

Q.No.12:
Four point charges Q, q, Q and q are placed at the corners of a square of side 'a' as shown in the figure.



Find the
(a) resultant electric force on a charge Q, and
(b) potential energy of this system.