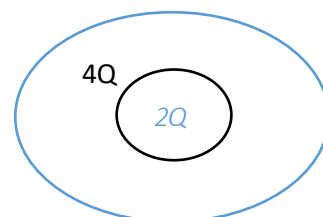


PHYSICS CLASS-XII ELECTROSTATICS

SUMMER VACATION HOME WORK

1. Write any two limitations of Coulomb's law.
2. Is the force acting between two point electric charges q_1 and q_2 kept at some distance apart in air, attractive or repulsive
when (a) $q_1 q_2 > 0$ (b) $q_1 q_2 < 0$?
3. How does the Coulomb force between two point charges depend upon the dielectric constant of the intervening medium ?
4. Two point charges having equal charges separated by 1 m distance experience a force of 8N. What will be the force experienced by them, if they are held in water, at the same distance ? (K FOR WATER IS 80)
5. Define dipole moment. Write its S.I. unit. Is it a scalar or vector quantity ?
6. What is the charge of an electric dipole ?
7. An electric dipole is placed in a uniform electric field, what is the net force acting on it ?
8. An electric dipole of dipole moment P is placed in a uniform electric field E . Write the value of the angle between P and E for which the torque experienced by the dipole is minimum.
9. Define electric flux. Write its S.I. unit.
10. State Gauss's law in electrostatics.
11. A charge q is enclosed by a spherical surface R . If the radius is doubled/ reduced to half, how would the electric flux through the surface change ?
12. A charge q is placed at the centre of a cube, what is the electric flux passing through one of its faces ?
13. Consider two hollow concentric spheres, S_1 & S_2 , enclosing charges $2Q$ & $4Q$ respectively as shown.
(i) Find out the ratio of the electric flux through them.
(ii) how will the electric flux through the sphere S_1 change, if a medium of dielectric constant ϵ_r introduced in the space inside S_1 in place of air ?
14. (i) An electric dipole is held in a uniform electric field. Using suitable diagram show that it does not undergo any translatory motion. Derive the expression for the torque acting on it.
(ii) What would happen if the field is non-uniform ?
(iii) What would happen if the external electric field E is increasing
(a) parallel to P and (b) anti-parallel to P ?
15. (a) Derive an expression for the electric field E due to a dipole of length ' $2a$ ' at a point distant r from the centre of



the dipole on the axial line. (b) Draw a graph of E versus r for $r \gg a$.

16. Derive an expression for the electric field intensity at a point on the equatorial line of an electric dipole of dipole moment P and length $2L$. What is the direction of this field ?

17. Using Gauss's law, derive an expression for the electric field intensity due to an infinitely long, straight wire of linear charge density λ C/m.

18. Using Gauss's law, obtain the expression for electric field intensity at a point due to an infinitely large, plane sheet of charge of charge density σ C/m². How is the field directed if the sheet is (i) positively charged (ii) negatively charged?

19. Using Gauss's law, deduce the expression for the electric field due to uniformly charged spherical conducting shell of radius R at a point (i) outside and (ii) inside the shell.

Plot a graph showing variation of electric field as a function of $r > R$ and $r < R$.

20. Given a uniform electric field $E = 6 \times 10^3$ i N/C, Find the flux of this field through a square of 10 Cm on a side whose plane is parallel to Y-Z plane. What would be the flux through the same square if the plane makes a 30 degree angle with x- axis ?

21. Two point charges 20 micro coulomb and 40 micro coulomb are separated by a distance of 50 cm in air. Find-

(i) the point on the line joining the charges, where the electrostatic potential is zero.

(ii) calculate the electrostatic potential energy of the system