

## Topic- Electric force & field

### Assignment-1

### Subject- Physics

1. Define the term electric dipole moment of a dipole. State its S.I unit? 1
2. Which orientation of an electric dipole in a uniform electric field would correspond to stable equilibrium & unstable equilibrium? 1
3. Is the electric field due to a charge configuration with total charge zero, necessarily zero? Justify. 1
4. Does the charge given to a metallic sphere depends on whether it is hollow or solid? Give reason for your answer. 1
5. Two point charges  $q_1$  &  $q_2$  are placed at a distance  $d$  apart. The electric field intensity is zero at a point P on the line joining as shown. Write two conclusions that you can draw from this. 2



6. Plot a graph showing the variation of Coulomb force ( $F$ )  $v/s \left( \frac{1}{r^2} \right)$  where  $r$  is the distance between the two charges of each pair of charges  $(1\mu C, 2\mu C)$  &  $(2\mu C, -3\mu C)$ . Interpret the graph obtained. 2
7. Two point charges  $4\mu C$  &  $1\mu C$  are separated by a distance of  $2m$  in air. Find the point on the line joining charges at which the net electric field of the system is zero. 2
8. Two point charges  $+q$  &  $-2q$  are placed at the vertices  $B$  &  $C$  of an equilateral triangle  $ABC$  of side ' $a$ '. Obtain the expression for
  - i. The magnitude and
  - ii. The direction of the resultant electric field at vertex  $A$  due to these two charges. 3
9. Two point charges  $+3q$  &  $-4q$  are placed at the vertices  $B$  &  $C$  of an equilateral triangle  $ABC$  of side ' $a$ '. Obtain the expression for
  - iii. The magnitude and
  - iv. The direction of the resultant electric field at vertex  $A$  due to these two charges. 3
10. Derive an expression for the torque experienced by an electric dipole kept in a uniform electric field. 3
11. An infinite number of charges each equal to  $4\mu C$  be placed along  $x$ -axis at  $x = 1m, x = 2m, x = 4m, x = 8m,$  and so on. Find the total force on a charge of  $1C$  placed at the origin. 3
12. An electric dipole is placed in a uniform electric field  $\vec{E}$  with its dipole moment  $\vec{P}$  parallel to the field. Find
  - I. The work done in turning the dipole till its dipole moment points in the direction opposite to  $\vec{E}$ .
  - II. The orientation of the dipole for which the torque acting on it becomes maximum. 5
13. 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 distances from the ring, it behave like a point charge. 5
14. Derive the expression for electric field at a point on the equatorial line of an electric dipole. 3
15. Derive an expression for the electric field  $E$  due to a dipole of length ' $2a$ ' at a point distance  $r$  from the center of the dipole on the axial line. Draw a graph of  $E v/s r$  for  $r \gg \gg a$ . 5

### For more questions with solution (NCERT)

<https://drive.google.com/file/d/1lgZMIaPuJ6sR4tfJZ1VCmi3mWsJa-FgE/view>