**National Institute of Open Schooling**
Senior Secondary
**Lesson 15 – Electric Charge and Electric field**
WORKSHEET – 15

Q.1 Perform simple activities to demonstrate the existence of charges and forces between them. On the basis of your observations infer the basic properties of electric charges. Also explain what will happen to the normal flow of tap water when a charged rod is brought near it?

Q.2 If the total charge enclosed by a surface is zero, does it imply that the electric field everywhere on the surface is zero? Conversely, if the electric field everywhere on a surface is zero, does it imply that net charge inside is zero.

Q.3 Four identical metallic spheres can be treated as point charges. Sphere A and B have charges "Qa" and "Qb" with separation r as shown in the figure given below.
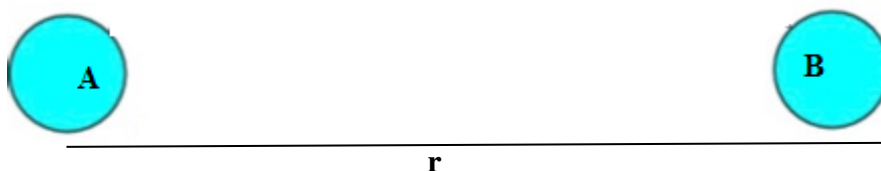

Sphere A is touched with uncharged sphere C and sphere B with uncharged sphere D. Separation between spheres A and B is then reduced to r/2 as shown in the figure given below.
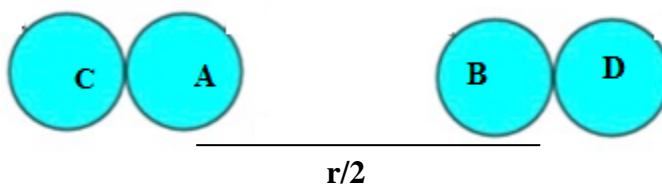
Find new electrostatic force between spheres A and B in terms of the previous force.

Q.4 Figure given below shows tracks of the three charged particles in a uniform electrostatic field. Which particle has lowest charge to mass ratio?
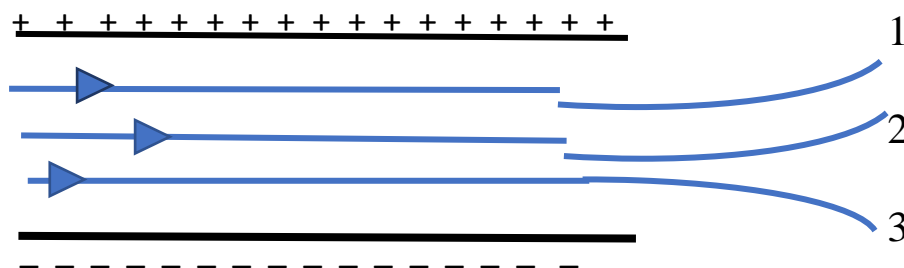
Q.5 a) Consider a point charge +Q is kept in the vicinity of uncharged conducting plate. Sketch electric field lines between the charge and the plate.
b) The distance of the field point, on the equatorial plane of a small electric dipole is halved. By what factor does the electric field due to the dipole change?

Q.6 Consider three point charges +2q, -q and +3q. The charges +2q and -q are enclosed within a surface "S" and +3q is outside the surface "S" as shown in the figure given below What is the electric flux due to this configuration through the surface "S"?
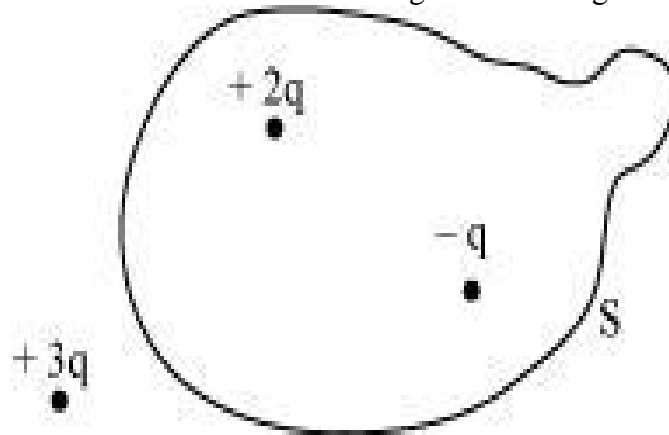
Q.7 An electric dipole of dipole moment "p" is placed in a uniform electric field "E". Write the expression for the torque experienced by the dipole. Identify two pairs of perpendicular vectors in the expression.
Show diagrammatically the orientation of the dipole in the field for which the torque is
a) Maximum b) Half of the maximum value and c) Zero.

Q.8 A charge q is placed at the centre of the line joining two equal charges Q. Show that the system of three charges will be in equilibrium if q = -Q/4.

Q.9 A point charge is placed at the centre of a closed Gaussian spherical surface of radius r. How is the Electric flux through the surface affected when the following changes are made in turn?
   a) The spherical surface is replaced by a cylindrical surface of the same radius?
   b) The point charge is replaced by an electric dipole?

Q.10 Plot a graph showing the variation of F versus $1/r^2$, where r is the distance between two charges of each pair of charges (1C, 2C) and (2C , -3C). Observe the graph obtained and write your interpretation.