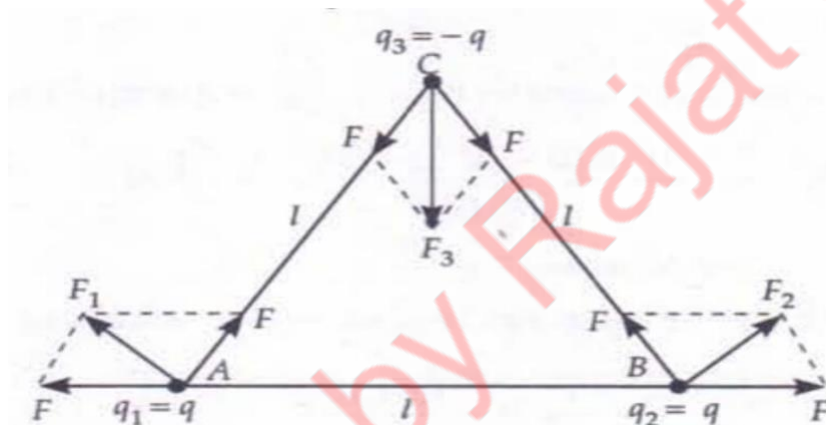# ELECTRIC FIELD AND CHARGES

## SENSATE THE PHYSICS BY RAJAT SACHDEV

9580951094, 7355763284

1. Describe how two metal spheres can be oppositely charged by induction.

2. A free pith-ball A of 8 g carries a positive charge of 5×10^{-8} C. What must be the nature and magnitude of charge that should be given to a second Pith-ball B fixed 5 cm below the former ball so that the upper Ball is stationary?

3. 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.

4. Consider the charges q, q and - q placed at the vertices of an equilateral triangle, as shown in Fig. What is the force on each charge ?

5. How many electrons should be removed from a coin of mass 1.6 g, so that it may just float in an electric field of intensity 109 Net, directed upward?

6. If an oil drop of weight 3.2×10^{-13} N is balanced in an electric field of 5×10^{5} Vm^{-1}, find the charge on the oil drop.

7. Two point charges of $+5 \times 10^{-19}$C and $+20 \times 10^{-19}$ C are separated by a distance of 2 m. Find the point on the line joining them at which electric field intensity is zero.

8. An electric dipole, when held at 30° with respect to a uniform electric field of 10^4 NC^{-1} experiences a torque of 9×10^{-26} Nm. Calculate dipole moment of the dipole.

9. Sketch and explain the field lines of (i) a positive point charge, (ii) a negative point charge, (iii) two equal and opposite charges, (iv) two equal positive charges and (v) a positively charged plane conductor.

10. A cylinder is placed in a uniform electric field **E** with its axis parallel to the field. Show that the total electric flux through the cylinder is zero.

11. Figure shows five charged lumps of plastic and an electrically neutral coin. The cross-section of a Gaussian surface S is indicated. What is the net electric flux through the surface if $q_1 = q_4 = +3.1$ n C, $q_2 = q_5 = -5.9$ nC and $q_3 = -3.1$ nC?
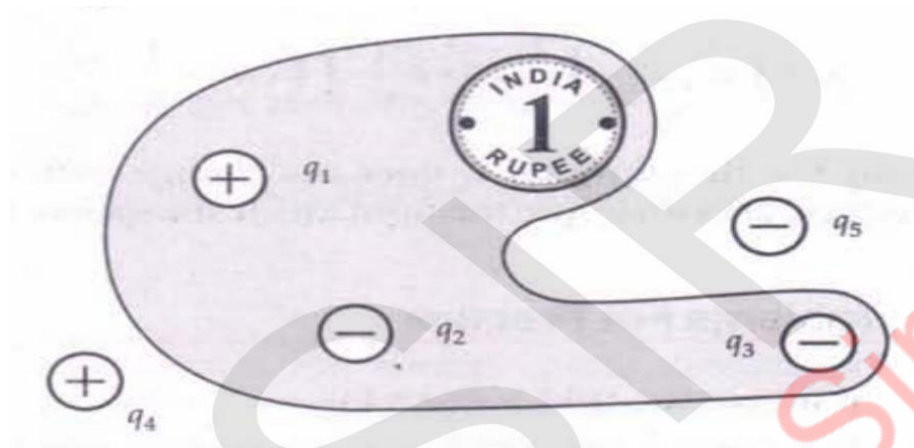
12. Apply Gauss's theorem to calculate the electric field of a thin infinitely long straight line of charge, with a uniform charge density of λ Cm^{-1}.

13. Force between two point charges kept at a distance d apart in air is F. If these charges are kept at the same distance in water, how does the electric force between them change?

14. Fig. shows two large metal plates, P_1 and P_2, tightly held against each other and placed between two equal and unlike point charges perpendicular to the line joining them.
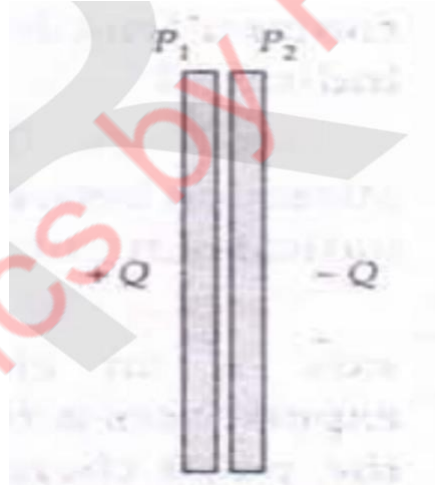
(i) What will happen to the plates when they are released ?

(ii) Draw the pattern of the electric field lines for the system.

15. A uniformly charged conducting sphere of 2.4 m diameter has a surface charge density of 80.0 microcoulomb/m^2. (i) Find The charge on the sphere. (ii) What is the total electric flux leaving the surface of the sphere ?