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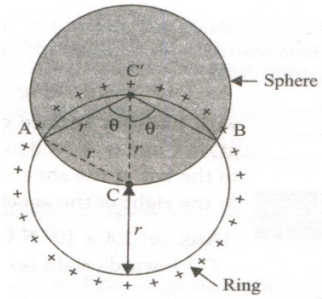
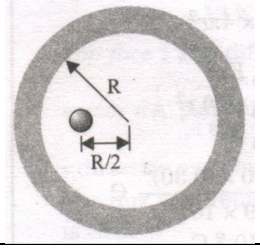
Class 12 (Physics)

Sheet 1 (Electrostatics)

1	A small ball of mass 2 x 10^{-3}kg having a charge of 1μC is suspended by a string of length 0.8m. Another identical ball having the same charge is kept at the point of suspension. Determine the minimum horizontal velocity which should be imparted to the lower ball so that it can make complete revolution.
2	An infinite number of charges, each equal to 4μC, are placed along x-axis at x= 1m, 2m, 4m, 8m, and so on. Find the total force on a charge of 1C placed at the origin.
3	Three particles, each of mass 1g and carrying a charge q, are suspended from a common point by insulated mass less strings, each 1m long. If the particles are in equilibrium and are located at the corners of an equilateral triangle of sides of length 3cm, calculate the charge q on each particle. Take g= 10m/s^{-2}
4	Determine the electric field due to a line charge lying along y-axis between y = -a and y = +a. Given positive charge q is distributed uniformly along the line.
5	Two identically charged spheres are suspended by strings of equal lengths. The strings make an angle of 30^0 with each other. When suspended in a liquid of density 800 kgm^{-3} , the angle remains the same. What is the dielectric constant of the liquid? The density of the material of the spheres is 1600kg m^{-3}.
6	A charge of 4 x 10^{-9} C is distributed uniformly over the circumference of a conducting ring of radius 0.3 m. Calculate the field intensity at a point on the axis of the ring at 0.4m from its centre. Also, calculate the electric field at the centre of the ring.
7	An early model for an atom considered it to have a positively charged point nucleus of charge Ze surrounded by a uniform density of negative charge up to a radius R. The atom as a whole is neutral. For this model, what is the electric field at a distance 'r' from the nucleus? For r < R & r ≥ R
8	Consider a ring of radius r on which a charge q has been uniformly distributed. If a sphere of radius r is centered on the circumference of the ring, what is the electric flux through the surface of the sphere?
	
9	Charge is distributed uniformly throughout an infinitely long cylinder of radius R. show that E at a distance r from the cylinder axis (r < R) is given by E = $\frac{\rho r}{2\varepsilon}$, where ρ is the density of charge. What result do you expect for r >R
10	Fig. shows a cross section of a spherical metal shell of inner radius R. A point charge of -5μC is located at a distance R/2 from the centre of the shell. If the shell is electrically neutral, what are the (induced) charges on its inner and outer surfaces? Are those charges uniformly distributed? What is the field pattern inside and outside the shell?