

6. A point charge with value Q is off center in a spherical surface of radius R . Which of the following is true?

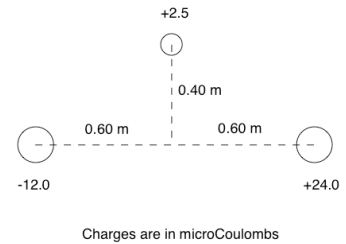
- a) the electric field through each point of the sphere is the same and equals $\frac{Q}{4\pi R^2 \epsilon_0}$
- b) the electric field is everywhere perpendicular to the surface
- c) the net electric flux through the surface is Q/ϵ_0
- d) the electric field's magnitude is constant over the sphere

7. An electron moves from lower potential to higher potential. Does its kinetic energy increase or decrease? Explain.

Long Problems (20 points each, drop the low one)

1. For the arrangement of three point charges on the right,

a) Calculate the vector electric field on the $2.5 \mu\text{C}$ charge



b) Find the acceleration of the $2.5 \mu\text{C}$ charge if its mass is 1.40 g and it is released.

2. For the arrangement of point charges in problem 1,

a) Find the total electric potential energy

b) on next page

b) Find the speed of the $2.5 \mu\text{C}$ charge if its mass is 1.40 g and it is released, after it has flown off to a very great distance.

3. An infinitely long insulating cylinder with radius $R = 12 \text{ cm}$ lies on the y axis.

a) USE GAUSS' LAW to find the electric field at a distance $r = 5.0 \text{ cm}$ from the cylinder's axis if it has a uniform charge density of $\rho = 3.3 \times 10^{-8} \text{ C/m}^3$.

b) Find the charge per unit length on the cylinder.

c) We now place a conducting cylindrical shell with inner radius 15 cm and outer radius 20 cm coaxial with the insulating cylinder. It carries a net charge/unit length of $1.00 \mu\text{C/m}$. Find the charge/unit length on the outer surface of the shell.

4. Two spheres are very far apart compared to their diameters, and connected by a long, thin conducting wire. Sphere 1 has a radius of 3.5 cm and sphere 2 has a radius of 7.0 cm . The electric field just outside the surface of sphere 1 is $4.5 \times 10^3 \text{ N/C}$.

a) Find the charge on sphere 1

b) Find the potential of sphere 1

part c) on next page

c) What is the total charge on the pair of spheres, if we can neglect any charge on the wire?