Ch. 24 (Dr. Gondal-Phys102)

042

1. A very long uniform line of charge having a linear charge density of 6.8 micro-C/m lies along x-axis. A second line of charge has a linear charge density of -3.40 micro-C/m and is parallel to x-axis at y = 0.5 m. What is the net electric field at point where y= 0.25 m on y-axis? A1 7.3*10**5 N/C along +y-axis.

2. Which of the following statements are CORRECT:
(1) The electric flux through a Gaussian surface depends on
the shape of the surface. (2) The electric flux through a closed surface depends on the net charge enclosed by the surface. (3) The electric field inside a uniformly charged solid conducting sphere in electrostatic equilibrium is zero. (4) The electric potential inside a uniformly charged solid conducting sphere in electrostatic equilibrium is zero. A1 2 and 3 only.

3. The net electric flux passing through a closed surface is -4.00*10**2 N*m**2/C. What is net electric charge contained inside the surface if the surface is a cylinder of height 3.52 cm and radius 1.12 cm. A1 -3.54*10**(-9) C.

4. A positive point charge q sits at the center of a hollow spherical shell. The shell, with radius R and negligible thickness, has net charge -2q. The electric field strength outside the spherical shell (at r>R) will be: A1 k*q/r**2 radially inwards.

5. A charged, isolated, large non-conducting plate is placed on the XY-plane. At 1.5 m from the plate, on Z-axis, the electric field measured was 10**4 N/C and directed into the plate. What is the charge density on the plate? A1 -1.8*10**(-7) C/m**2.

SECOND MAJOR T-041

1) Figure 1 shows three situations in which a Gaussian cube sits in an electric field. The arrows and the values indicates the directions (in N*m**2/C) of the flux through the six sides of each cube. In which situations does the cube enclose, a positive net charge, a negative net charges and zero net charge respectively.
A1 2,3 and 1.

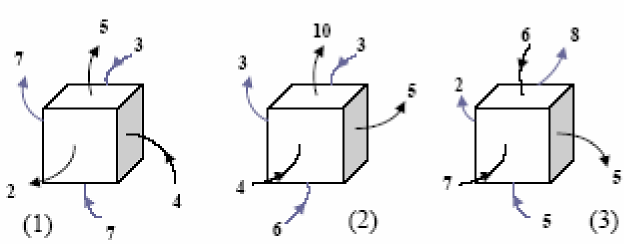

Figure (1)

2) In figure 2, the magnitude of the electric field at point A, due to an infinite line charge density of 9.0*10**(-6) C/m, is 7.2*10**4 N/C. If the point A is at a distance R from the line charge, what is R? A1 2.3 m.

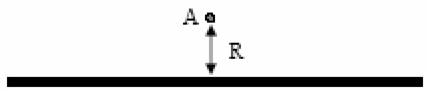

Figure (2)

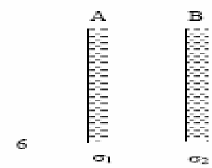

Figure 7

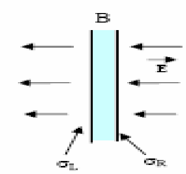

Figure 8

3) A non conducting sphere, of radius 4.0 m, has a charge density
of 2.0 micro-C/m**3. What is the electric field at a distance 1.7 m from the center? A1 1.3*10**5 N/C.
SECOND MAJOR T-032

1)A point charge, q1 = -2.0*10**(-6) C, is placed inside a cube
of side 5.0 cm, and another point charge q2 = 3.0*10**(-6) C is placed outside the cube. Find the net electric flux through the surfaces of the cube. **A:** -2.3*10**5 N m**2/C
2)Figure 7 shows portions of two large, parallel, nonconducting
sheets, A and B. The surface charge densities are: sigma 1 = -4.5 micro-C/m**2 and sigma 2 = -6.5 micro-C/m**2. Find the electric field at any point between the two sheets. **A:** 1.1*10**5 N/C towards B.
3) A hollow metallic sphere, of radius 2.0 cm, is filled with a non-conducting material which carries a charge of 5.0 pico-C distributed uniformly throughout its volume. What is the magnitude of the electric field 1.5 cm from the center of the sphere? **A:** 84 N/C.
4) A total charge of 5.00*10**(-6) C is uniformly distributed inside an irregularly-shaped insulator. The volume of the insulator is 3.0 m**3. Now, imagine a cube of volume 0.50 m**3 inside the insulator. What is the total electric flux through the surfaces of the cube? **A:** 9.4*10**4 N*m**2/C.
5) A 40 N/C uniform electric field points perpendicularly toward a large neutral conducting sheet, as shown in figure 8. The surface charge densities (in C/m**2) on the right, sigma-R and left, sigma-L, respectively are: A1 - 3.5*10**(-10) ; +3.5*10**(-10).

SECOND MAJOR T-031

1)A long noncoducting cylinder (radius 12.0 cm) has a charge of uniform density 5.0 nano-C/m**3 distributed through its column. Determine the magnitude of the electric field 5.0 cm from the axis of the cylinder. [See figure (3)].**A:**.
2)For the two infinite dielectric sheets, see figure (5), find the magnitude of the electric field at a point P. Consider that each sheet has a positive surface charge density of 10**2 C/m**2.A1 1.1*10**13 N/C.
3) A point charge of +4.0 micro-C lies at the center of a hollow
spherical conducting shell that has a net charge of -13.0 micro-C. If the inner radius of the shell is 2.0 cm and the outer radius is 3.0 cm, then the ratio between the charge density on the inner surface to the charge density on the outer surface is:**A:** 1 : 1.

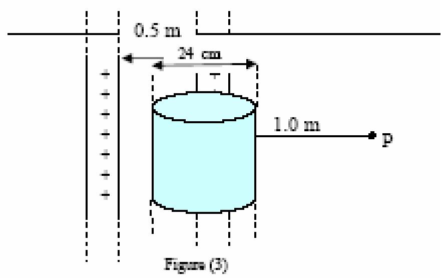

Figure (5)

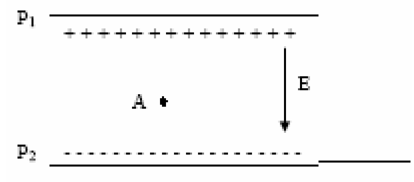

Figure (2)

SECOND MAJOR T-011
1) A point charge of -50e lies at the center of a hollow spherical metal shell that has a net charge of -100e, as seen in figure(4). Calculate the charge on the (a) shell's inner surface, and (b) on its outer surface. [e is the magnitude of the charge on the electron.] A. (a) Zero

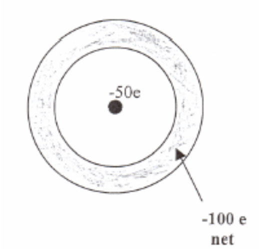

Figure 4

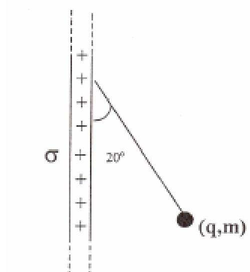

Figure 3

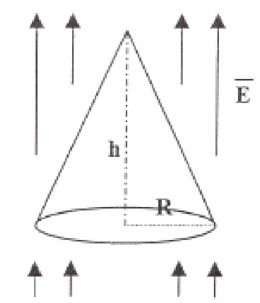

Figure 2

2) Calculate the electric flux (phi) through the curved surface of a cone of base radius R and height h. The electric field E is uniform and perpendicular to the base of the cone, and the field lines enter through the base. The cone has no charge enclosed inside it, as seen in figure (2). A. Pi*R*h*E.
3) As shown in figure (3), a small non-conducting ball of mass m = 1.0*10**(-6) kg and charge q = 2.0*10**(-8) C, distributed uniformly through its volume, hangs from an insulating thread that makes an angle theta = 20 degrees with a vertical, uniformly charged non-conducting sheet (shown in cross section). Considering the weight of the ball and assuming that the sheet extends far vertically and into and out of the page, calculate the surface charge density of the sheet. A. 2.5*10**(-9) C/m**2.

SECOND MAJOR T-012
1)A point charge of 2.0 micro-C is placed at the center of a cube 50 cm on edge. What is the flux through the bottom surface? A1 3.8*10**4 N*m**2/C.
2)An isolated conductor of arbitrary shape has a net charge of -15*10**(-6) C. Inside the conductor is a cavity within which is a point charge q=-5.0*10**(-6) C. What is the charge on the cavity-wall, q(in), and what is the charge on the outer surface of the conductor, q(out)? [See figure (3)]. A1 q(in) = 5.0*10**(-6) C; q(out) = -20*10**(-6) C.

Problems from Book
P4, P6, P10, P13, P21,P26,P29,P43