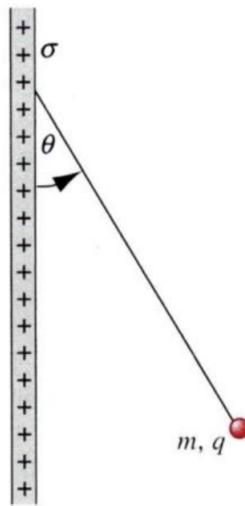


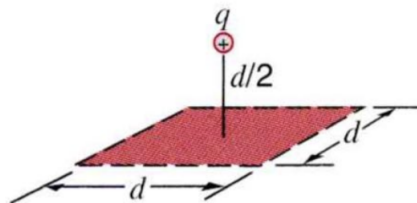
Collaborators:

**HRK P27.3 Solo** A small sphere whose mass  $m$  is 1.12 mg carries a charge  $q = 19.7$  nC. It hangs in the Earth's gravitational field from a silk thread that makes an angle  $\theta = 27.4^\circ$  with a large, uniformly charged, non-conducting sheet as in Fig. 27-32. Calculate the uniform charge density  $\sigma$  for the sheet.



**FIGURE 27-32.** Problem 3.

**HRK P27.7** A point charge  $+q$  is a distance  $d/2$  from a square surface of side  $d$  and is directly above the center of the square as shown in Fig. 27-26. Find the electric flux through the square. (Hint: Think of the square as one face of a cube with edge  $d$ )



**FIGURE 27-26.** Exercise 7.

**HRK P27.16** A plane slab of thickness  $d$  has a uniform volume charge density of  $\rho$ . Find the magnitude of the electric field at all points in space both (a) inside and (b) outside the slab in terms of  $x$  the distance measured from the median plane of the slab.

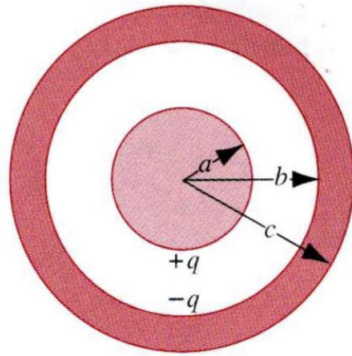
■

**HRK P27.17** A solid nonconducting sphere of radius  $R$  carries a nonuniform charge distribution, with charge density,  $\rho = \rho_S r / R$ , where  $\rho_S$  is a constant and  $r$  is the distance from the center of the sphere. Show that (a) the total charge on the sphere is  $Q = \pi \rho_S R^3$  and (b) the electric field inside the sphere is given by;

$$E = \frac{1}{\pi \epsilon_0} \frac{Q}{R^4} r^2$$

■

**HRK P27.4** Figure 27-33 shows a charge  $+q$  arranged as a uniform conducting sphere of radius  $a$  and placed at the center of a spherical conducting shell of inner radius  $b$  and outer radius  $c$ . The outer shell carries a charge of  $-q$ . Find  $E(r)$  at locations (a) within the sphere, ( $r < a$ ), (b) between the sphere and the shell, ( $a < r < b$ ), (c) inside the shell ( $b < r < c$ ) and (d) outside the shell ( $r > c$ ). (e) What charges appear on the inner and outer surfaces of the shell.



**FIGURE 27-33.** Problem 4.

■

**HRK E29.29** A  $1 - \mu\text{C}$  point charge is embedded in the center of a solid pyrex sphere of radius  $R = 10\text{cm}$ . (a) Calculate the electric field strength  $E$  just beneath the surface of the sphere. (b) Assuming that there are no other *free* charges, calculate the strength of the electric field just outside the surface of the sphere. (c) What is the induced surface charge density  $\sigma_{ind}$  on the surface of the Pyrex sphere?

■