21.74. Two identical spheres with mass m are hung from silk threads of length L, as shown in Fig. 21.44. Each sphere has the same charge, so $q_1 = q_2 = q$. The radius of each sphere is very small compared to the distance between the spheres, so they may be treated as point charges. Show that if the angle θ is small, the equilibrium separation d between the spheres is $d = (q^2L/2\pi\epsilon_0 mg)^{1/3}$. (*Hint:* If θ is small, then $\tan\theta \cong \sin\theta$.)

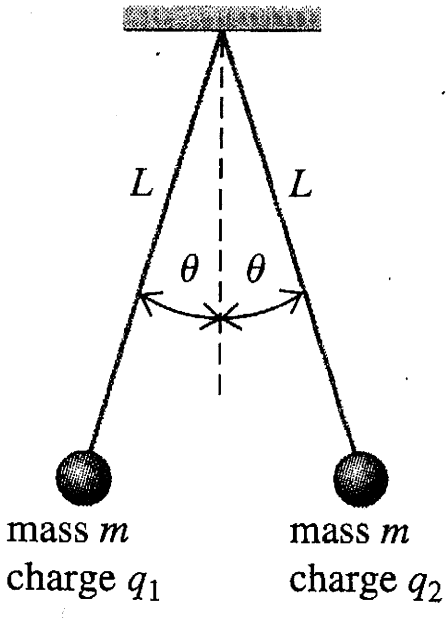

Figure 21.44 Problems 21.74, 21.75, and 21.76.

Note that $k_e = \dfrac{1}{4\pi\varepsilon_o}$.