4-8. For α particles of 7.7 MeV (those used by Geiger and Marsden), what impact parameter will result in a deflection of 2° for a thin gold foil?

4-40. Geiger and Marsden used α particles with 7.7-MeV kinetic energy and found that when they were scattered from thin gold foil, the number observed to be scattered at all angles agreed with Rutherford's formula. Use this fact to compute an upper limit on the radius of the gold nucleus.

4-49. A small shot of negligible radius hits a stationary smooth, hard sphere of radius R, making an angle β with the normal to the sphere, as shown in Figure 4-25. It is reflected at an equal angle to the normal. The scattering angle is $\theta = 180° - 2\beta$, as shown. (*a*) Show by the geometry of the figure that the impact parameter b is related to θ by $b = R\cos\frac{1}{2}\theta$. (*b*) If the incoming intensity of the shot is I_0 particles/s · area, how many are scattered through angles greater than θ? (*c*) Show that the cross section for scattering through angles greater than 0° is πR^2. (*d*) Discuss the implication of the fact that the Rutherford cross section for scattering through angles greater than 0° is infinite.

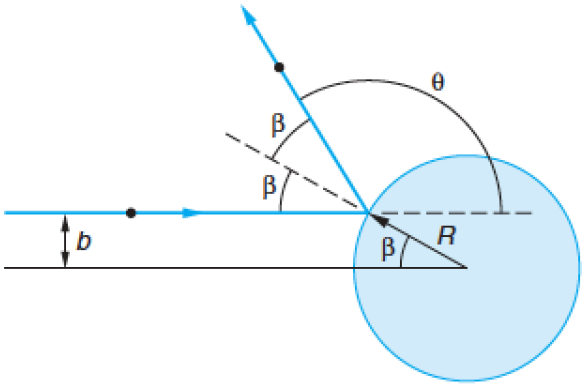

Figure 4-25 Small particle scattered by a hard sphere of radius R.