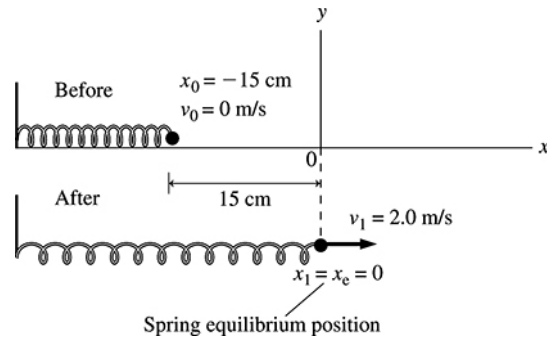


10.65. (a) A spring gun is compressed 15 cm to launch a 200 g ball on a horizontal, frictionless surface. The ball has a speed of 2.0 m/s as it loses contact with the spring. Find the spring constant of the gun.

(b)



We place the origin of our coordinate system on the free end of the spring in the equilibrium position. Because the surface is frictionless, the mechanical energy for the system (ball + spring) is conserved.

(c) The conservation of energy equation is

$$K_f + U_{sf} = K_i + U_{si}$$

$$\frac{1}{2}mv_1^2 + \frac{1}{2}k(0 \text{ m})^2 = \frac{1}{2}m(0 \text{ m/s})^2 + \frac{1}{2}k(-0.15 \text{ m})^2$$

$$(0.200 \text{ kg})(2.0 \text{ m/s})^2 = k(-0.15 \text{ m})^2$$

$$k = 36 \text{ N/m}$$