

13. According to Newton's second law, the magnitude of the force is given by  $F = ma$ , where  $a$  is the magnitude of the acceleration of the neutron. We use kinematics (Table 2-1) to find the acceleration that brings the neutron to rest in a distance  $d$ . Assuming the acceleration is constant, then  $v^2 = v_0^2 + 2ad$  produces the value of  $a$ :

$$a = \frac{(v^2 - v_0^2)}{2d} = \frac{-(1.4 \times 10^7 \text{ m/s})^2}{2(1.0 \times 10^{-14} \text{ m})} = -9.8 \times 10^{27} \text{ m/s}^2.$$

The magnitude of the force is consequently

$$F = m|a| = (1.67 \times 10^{-27} \text{ kg})(9.8 \times 10^{27} \text{ m/s}^2) = 16 \text{ N}.$$