

Chapter 2 Problem 73 †

Given

$$y_0 = 12 \text{ m}$$

$$v_0 = 0 \text{ m/s}$$

$$g_{\text{moon}} = -1.62 \text{ m/s}^2$$

Solution

Find the time it takes to fall and its impact speed.

Use the following kinematic equation to find the time.

$$\Delta y = y - y_0 = v_0 t + \frac{1}{2} a t^2$$

Since the initial velocity is zero this equation becomes

$$\Delta y = \frac{1}{2} a t^2$$

Solving for t gives.

$$t = \sqrt{\frac{2\Delta y}{a}} = \sqrt{\frac{2(y_f - y_0)}{a}} = \sqrt{\frac{2(0 \text{ m} - 12 \text{ m})}{-1.62 \text{ m/s}^2}} = 3.85 \text{ s}$$

The impact velocity is then

$$v = v_0 + at = 0 \text{ m/s} + (-1.62 \text{ m/s}^2)(3.85 \text{ s}) = -6.24 \text{ m/s}$$

The negative sign indicates that the velocity is in the downward direction.

†Problem from Essential University Physics, Wolfson