$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$

$$\frac{1}{2}(v_f^2 - 0) = -(9.80\ \text{m/s}^2)(-0.112\ \text{m})$$

$$v_f = \sqrt{2(-9.80\ \text{m/s}^2)(-0.112\ \text{m})}$$

$$= 1.48\ \text{m/s}$$

12. Note: Initial vertical speed is zero.

$$\Delta E_k + \Delta E_p = 0$$

$$\Delta E_k = -\Delta E_p$$

$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$

$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$

$$\frac{1}{2}(v_f^2 - 0) = -(9.80\ \text{m/s}^2)(-5.0\ \text{m})$$

$$v_f = \sqrt{2(-9.80\ \text{m/s}^2)(-5.0\ \text{m})}$$

$$= 9.9\ \text{m/s}$$

13.

$$\Delta E_k + \Delta E_p = 0$$

$$\Delta E_k = -\Delta E_p$$

$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$

$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$

$$\frac{1}{2}(v_f^2 - 0) = -(9.80\ \text{m/s}^2)(-2.0\ \text{m})$$

$$v_f = \sqrt{2(-9.80\ \text{m/s}^2)(-2.0\ \text{m})}$$

$$= 6.3\ \text{m/s}$$

Lesson 6–Power

1. $P = \dfrac{W}{t}$

$$t = \frac{W}{P}$$

$$= \frac{(45.0\ \text{kg})(9.80\ \text{m/s}^2)(6.0\ \text{m})}{1.50\times10^3\ \text{W}}$$

$$= 1.8\ \text{s}$$

2. $P = \dfrac{W}{t}$

$$= \frac{(20.0\ \text{kg})(9.80\ \text{m/s}^2)(2.50\ \text{m})}{2.00\ \text{s}}$$

$$= 245\ \text{W}$$

3. $v_{\text{average}} = \dfrac{v_f + v_0}{2}$

$$= \frac{3.00\ \text{m/s} + 0}{2}$$

$$= 1.50\ \text{m/s}$$

$$v_f^2 = v_0^2 + 2ad$$

$$(3.00\ \text{m/s})^2 = 2(a)(1.5\ \text{m})$$

$$a = 3.0\ \text{m/s}^2$$

$$F = ma$$

$$= (2.00\ \text{kg})(3.0\ \text{m/s}^2)$$

$$= 6.0\ \text{N}$$

$$P = Fv$$

$$= (6.0\ \text{N})(1.50\ \text{m/s})$$

$$= 9.0\ \text{W}$$

4. power out $= Fv$ or mgv

$$= (8.5\times10^2\ \text{kg})(9.80\ \text{m/s}^2)(1.00\ \text{m/s})$$

$$= 8.33\times10^3\ \text{W}$$

$$\text{efficiency} = \frac{\text{power out}}{\text{power in}}\times100$$

$$= \frac{8.33\times10^3\ \text{W}}{10.0\times10^3\ \text{W}}\times100$$

$$= 83.3\%$$

5. $v_f^2 = v_0^2 + 2d$

$$(6.0\ \text{m/s})^2 = 2\,(a)(2.0\ \text{m})$$

$$= 9.0\ \text{m/s}^2$$

$$F = ma$$

$$= (5.0\ \text{kg})(9.0\ \text{m/s}^2)$$

$$= 45\ \text{N}$$

$$F = T - F_f$$

$$T = F + F_f$$

$$= 45\ \text{N} + 4.0\ \text{N}$$

$$= 49\ \text{N}$$

$$v_{\text{average}} = \frac{v_f + v_0}{2}$$

$$= \frac{6.0\ \text{m/s} + 0}{2}$$

$$= 3.0\ \text{m/s}$$

$$P = Fv$$

$$= (49\ \text{N})(3.0\ \text{m/s})$$

$$= 1.5\times10^2\ \text{W}$$

