4. power output $= F_g v = mgh$
$= (8.50\times10^2 \text{ kg})(9.81 \text{ m/s}^2)(1.00 \text{ m/s})$
$= 8.34\times10^3 \text{ W}$

$$\text{efficiency} = \frac{\text{power out}}{\text{power in}}\times100$$
$$= \frac{8.34\times10^3 \text{ W}}{10.0\times10^3 \text{ W}}\times100$$
$$= 83.4\%$$

5. $v^2 = v_0^2 + 2ad$
$(6.0 \text{ m/s})^2 = 2(\text{a})(2.0 \text{ m})$
$a = 9.0 \text{ m/s}^2$

$F_{net} = ma$
$= (5.0 \text{ kg})(9.0 \text{ m/s}^2)$
$= 45 \text{ N}$
$F_{net} = F_T - F_{fr}$
$F_T = F_{net} + F_{fr}$
$= 45 \text{ N} + 4.0 \text{ N}$
$= 49 \text{ N}$

$$v_{av} = \frac{v + v_0}{2}$$
$$= \frac{6.0 \text{ m/s} + 0}{2}$$
$$= 3.0 \text{ m/s}$$

$P = F_T v_{av}$
$= (49 \text{ N})(3.0 \text{ m/s})$
$= 1.5\times10^2 \text{ W}$

6. $$\text{power out} = \frac{mgh}{t}$$
$$= \frac{(20.0 \text{ kg})(9.81 \text{ m/s}^2)(5.00 \text{ m})}{3.50 \text{ s}}$$
$$= 280 \text{ W}$$

$$\text{efficiency} = \frac{\text{power out}}{\text{power in}}\times100\%$$
$$= \frac{280 \text{ W}}{5.00\times10^2 \text{ W}}\times100\%$$
$$= 56.0\%$$

7. $$\text{efficiency} = \frac{\text{power out}}{\text{power in}}\times100\%$$
$$\text{power out} = \frac{\text{efficiency}\times\text{power in}}{100\%}$$
$$= (0.82)(1.00\times10^5 \text{ W})$$
$$= 8.2\times10^4 \text{ W}$$

$$\text{power} = \frac{mgh}{t}$$
$$t = \frac{mgh}{\text{power}}$$
$$= \frac{(50.0 \text{ kg})(9.81 \text{ m/s}^2)(8.00 \text{ m})}{(8.2\times10^4 \text{ W})}$$
$$= 0.048 \text{ s}$$

Lesson 3—Potential Energy

PRACTICE EXERCISES ANSWERS AND SOLUTIONS

1. $E_p = F_g d$
$= (25.0 \text{ N})(2.10 \text{ m})$
$= 52.5 \text{ J}$

2. $E_p = Fd$
$= (65.0 \text{ N})(6.5\times10^{-2} \text{ m})$
$= 4.2 \text{ J}$

3. $E_p = mgh$
$= (2.75 \text{ kg})(9.81 \text{ m/s}^2)(7.00 \text{ m})$
$= 189 \text{ J}$

4. $E_p = mgh$
$= (2.0 \text{ kg})(9.81 \text{ m/s}^2)(0.25 \text{ m})$
$= 4.9 \text{ J}$

5. $E_p = mgh$
$= (2.0\times10^2 \text{ kg})(9.81 \text{ m/s}^2)(6.0 \text{ m})$
$= 1.2\times10^4 \text{ J}$

Lesson 4—Kinetic Energy

PRACTICE EXERCISES ANSWERS AND SOLUTIONS

1. $$E_k = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(3.0 \text{ kg})(7.5 \text{ m/s})^2$$
$$= 84 \text{ J}$$