6. $\text{power out} = \dfrac{mgh}{t}$

$= \dfrac{(20.0\text{ kg})(9.80\text{ m/s}^2)(5.00\text{ m})}{3.50\text{ s}}$

$= 280\text{ W}$

$\text{efficiency} = \dfrac{\text{power out}}{\text{power in}} \times 100$

$= \dfrac{280\text{ W}}{5.00 \times 10^2\text{ W}} \times 100$

$= 56.0\%$

7. $\text{efficiency} = \dfrac{\text{power out}}{\text{power in}} \times 100$

$\text{power out} = \dfrac{\text{efficiency} \times \text{power in}}{100}$

$= (82\%)(1.00 \times 10^5\text{ W})$

$= 8.2 \times 10^4\text{ W}$

$\text{power} = \dfrac{mgh}{t}$

$t = \dfrac{mgh}{\text{power}}$

$= \dfrac{(50.0\text{ kg})(9.80\text{ m/s}^2)(8.00\text{ m})}{(8.2 \times 10^4\text{ W})}$

$= 0.048\text{ s}$

Lesson 7–Machines and Efficiency

1. $\text{Work output} = mgh$

$= (225\text{ kg})(9.80\text{ m/s}^2)(1.20\text{ m})$

$= 2646\text{ J}$

$\text{Work input} = Fd$

$= (315\text{ N})(10.0\text{ m})$

$= 3150\text{ J}$

$\text{Efficiency} = \dfrac{\text{Work out}}{\text{Work in}} \times 100\%$

$= \dfrac{2646\text{ J}}{3150\text{ J}} \times 100\%$

$= 84.0\%$

2. $\text{Work output} = mgh$

$= (935\text{ N})(5.0\text{ m})$

$= 4675\text{ J}$

$\text{Work input} = Fd$

$= (455\text{ N})(15.0\text{ m})$

$= 6825\text{ J}$

$\text{Efficiency} = \dfrac{\text{Work out}}{\text{Work in}} \times 100\%$

$= \dfrac{4675\text{ J}}{6825\text{ J}} \times 100\%$

$= 68\%$

3. $\text{Work output} = mgh$

$= (75.0\text{ kg})(9.80\text{ m/s}^2)(3.0\text{ m})$

$= 2205\text{ J}$

$\text{Efficiency} = \dfrac{\text{Work out}}{\text{Work in}} \times 100\%$

$\text{Work in} = \dfrac{2205\text{ J}}{78.5\%} \times 100\%$

$= 2809\text{ J}$

$\text{Work input} = Fd$

$F = \dfrac{\text{Work in}}{d}$

$= \dfrac{2809\text{ J}}{8.0\text{ m}}$

$= 3.5 \times 10^2\text{ N}$

4. $\text{Work output} = mgh$

$= (95\text{ kg})(9.80\text{ m/s}^2)(0.11\text{ m})$

$= 102\text{ J}$

$\text{Efficiency} = \dfrac{\text{Work out}}{\text{Work in}} \times 100\%$

$\text{Work in} = \dfrac{102\text{ J}}{63\%} \times 100\%$

$= 163\text{ J}$

$\text{Work input} = Fd$

$d = \dfrac{\text{Work in}}{F}$

$= \dfrac{163\text{ J}}{262\text{ N}}$

$= 0.62\text{ m}$

$= 62\text{ cm}$

5. $\text{Work output} = mgh$

$= (65.0\text{ kg})(9.80\text{ m/s}^2)(1.92\text{ m})$

$= 1223\text{ J}$

$\text{Efficiency} = \dfrac{\text{Work out}}{\text{Work in}} \times 100\%$