

$$\begin{aligned}
 2. \quad F_g &= mg \\
 m &= \frac{F_g}{g} \\
 &= \frac{20.0 \text{ N}}{9.81 \text{ m/s}^2} \\
 &= 2.04 \text{ kg}
 \end{aligned}$$

$$\begin{aligned}
 E_k &= \frac{1}{2}mv^2 \\
 v &= \sqrt{\frac{2E_k}{m}} \\
 &= \sqrt{\frac{2(5.00 \times 10^2 \text{ J})}{2.04 \text{ kg}}} \\
 &= 22.1 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad v^2 &= v_0^2 + 2ad \\
 &= 2(2.5 \text{ m/s}^2)(15.0 \text{ m}) \\
 &= 75 \text{ m}^2/\text{s}^2 \\
 v &= 8.66 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 F_g &= mg \\
 m &= \frac{F_g}{g} \\
 &= \frac{10.0 \text{ N}}{9.80 \text{ m/s}^2} \\
 &= 1.02 \text{ kg}
 \end{aligned}$$

$$\begin{aligned}
 E_k &= \frac{1}{2}mv^2 \\
 &= \frac{1}{2}(1.02 \text{ kg})(8.66 \text{ m/s})^2 \\
 &= 38 \text{ J}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad v^2 &= v_0^2 + 2ad \\
 &= 2(9.81 \text{ m/s}^2)(7.0 \text{ m}) \\
 &= 137.34 \text{ m}^2/\text{s}^2 \\
 v &= 11.7 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 E_k &= \frac{1}{2}mv^2 \\
 &= \frac{1}{2}(8.0 \text{ kg})(11.7 \text{ m/s})^2 \\
 &= 5.5 \times 10^2 \text{ J}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad F_g &= mg \\
 m &= \frac{F_g}{g} \\
 &= \frac{10.0 \text{ N}}{9.80 \text{ m/s}^2} \\
 &= 1.02 \text{ kg}
 \end{aligned}$$

$$\begin{aligned}
 E_k &= \frac{1}{2}mv^2 \\
 v &= \sqrt{\frac{2E_k}{m}} \\
 &= \sqrt{\frac{2(3.00 \times 10^2 \text{ J})}{1.02 \text{ kg}}} \\
 &= 24.2 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 6. \quad E_k &= \frac{1}{2}mv^2 \\
 E_k &\propto v^2 \\
 E_k &\propto 3^2 \\
 E_k &\propto 9 \text{ times}
 \end{aligned}$$

### Lesson 5—Work-Energy Theorem

#### PRACTICE EXERCISES ANSWERS AND SOLUTIONS

The force in these equations is the net force.

$$\begin{aligned}
 1. \quad Fd &= \frac{1}{2}m(v^2 - v_0^2) \\
 (23.0 \text{ N})(5.0 \times 10^{-2} \text{ m}) &= \frac{1}{2}(0.12 \text{ kg})(v^2 - 0) \\
 v &= \sqrt{\frac{2(23.0 \text{ N})(5.0 \times 10^{-2} \text{ m})}{0.12 \text{ kg}}} \\
 &= 4.4 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 2. \quad Fd &= \frac{1}{2}m(v^2 - v_0^2) \\
 (-3.2 \text{ N})d &= \frac{1}{2}(1.1 \text{ kg})(0 - (7.5 \text{ m/s})^2) \\
 d &= \frac{\frac{1}{2}(1.1 \text{ kg})(-56.25 \text{ m}^2/\text{s}^2)}{-3.2 \text{ N}} \\
 &= 9.7 \text{ m}
 \end{aligned}$$