$$\frac{1}{2}\left(v_f^2 - (11.0\text{ m/s})^2\right) = -(9.80\text{ m/s}^2)(-1.3 \times 10^2\text{ m})$$

$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-1.3\times10^2\text{ m})+(11.0\text{ m/s})^2}$$

$$= 52\text{ m/s}$$

5.
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}(v_f^2 - 0) = -(9.80\text{ m/s}^2)(-4.0\text{ m})$$
$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-4.0\text{ m})}$$
$$= 8.9\text{ m/s}$$

6.
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}(v_f^2 - 0) = -(9.80\text{ m/s}^2)(-0.25\text{ m})$$
$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-0.25\text{ m})}$$
$$= 2.2\text{ m/s}$$

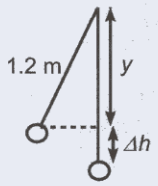
7. Find Δh first:
$$\sin 30.0° = \frac{\Delta h}{12.0\text{ m}}$$
$$\Delta h = 6.0\text{ m}$$
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}(v_f^2 - 0) = -(9.80\text{ m/s}^2)(-6.0\text{ m})$$
$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-6.0\text{ m})}$$
$$= 10.8\text{ m/s}$$

8.
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}(v_f^2 - 0) = -(9.80\text{ m/s}^2)(-8.0\text{ m})$$
$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-8.0\text{ m})}$$
$$= 13\text{ m/s}$$

9.
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}(v_f^2 - 0) = -(9.80\text{ m/s}^2)(-10.0\text{ m})$$
$$v_f = \sqrt{2(-9.80\text{ m/s}^2)(-10.0\text{ m})}$$
$$= 14\text{ m/s}$$

10.
$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$
$$\frac{1}{2}\left(v_f^2 - v_0^2\right) = -g\Delta h$$
$$\frac{1}{2}\left(0 - (3.5\text{ m/s})^2\right) = -(9.80\text{ m/s}^2)(\Delta h)$$
$$\therefore h = \frac{\frac{1}{2}\left(0 - (3.5\text{ m/s})^2\right)}{-9.80\text{ m/s}^2}$$
$$= 0.63\text{ m}$$

11.



Find Δh first
$$\cos 25° = \frac{y}{1.2\text{ m}}$$
$$y = 1.09\text{ m}$$
$$\therefore \Delta h = 1.2\text{ m} - y$$
$$= 1.2\text{ m} - 1.09\text{ m}$$
$$= 0.112\text{ m}$$

$$\Delta E_k + \Delta E_p = 0$$
$$\Delta E_k = -\Delta E_p$$
$$\frac{1}{2}m\left(v_f^2 - v_0^2\right) = -mg\Delta h$$