75. (a) \( K = (0.15 \text{ kg})(9.80 \text{ m/s}^2)(0.75 \text{ m})(\cos 0^\circ - \cos 60^\circ) = 0.551 \text{ J} = \frac{1}{2} mv^2 \),

so \( v = \sqrt{\frac{2(0.551 \text{ J})}{0.15 \text{ kg}}} = 2.7 \text{ m/s} \).

(b) Final height = initial height. \( y = L(1 - \cos 60^\circ) = (0.75 \text{ m})(1 - \cos 60^\circ) = 0.38 \text{ m} \).

(c) Half the speed means \( \frac{1}{2} \) of the kinetic energy because \( K = \frac{1}{2} mv^2 \).

\( \frac{1}{2}K = \frac{1}{4} (0.15 \text{ kg})(9.80 \text{ m/s}^2)(0.75 \text{ m})(\cos 0^\circ - \cos 60^\circ) = (0.15 \text{ kg})(9.80 \text{ m/s}^2)(0.75 \text{ m})(\cos 0^\circ - \cos \theta) \).

Solving, \( \cos \theta = 0.875 \), \( \theta = 29^\circ \).

76. (a) \( \frac{1}{2}mv^2 + U = \frac{1}{2}mv_0^2 + U_o \) \( \Rightarrow 0 + \frac{1}{2}kv^2 = \frac{1}{2}mv_0^2 + 0. \)

So \( x = \sqrt{\frac{m}{K}} v_o = \sqrt{\frac{1.5 \text{ kg}}{2.0 \times 10^3 \text{ N/m}}} \times (12 \text{ m/s}) = 0.33 \text{ m} \).

(b) \( \frac{1}{2}mv^2 + \frac{1}{2}kv^2 = \frac{1}{2}mv_0^2 + 0 \) \( \Rightarrow x = \sqrt{\frac{1.5 \text{ kg}}{2.0 \times 10^3 \text{ N/m}}} \times [(12 \text{ m/s})^2 - (6.0 \text{ m/s})^2] = 0.28 \text{ m} \).

77. \( W_{nc} = K + U - K_o - U_o = \frac{1}{2}mv^2 + 0 - 0 - mgv_o = \frac{1}{2}(28 \text{ kg})(2.5 \text{ m/s})^2 - (28 \text{ kg})(9.80 \text{ m/s}^2)(3.0 \text{ m}) \)

\[ = -7.4 \times 10^2 \text{ J} \]

78. (a) This system is nonconservative.

\( E_{top} = 0 + mg(25 \text{ m}) = (25mg) \text{ J} = (245m) \text{ J} \)

\( E_{bottom} = \frac{1}{2}m(20 \text{ m/s})^2 + 0 = (200m) \text{ J} \)

So \( E_{top} > E_{bottom} \).

(b) \( W_{nc} = K + U - K_o - U_o = \frac{1}{2}mv^2 + 0 - 0 - mgv_o = \frac{1}{2}(50 \text{ kg})(10 \text{ m/s})^2 - (50 \text{ kg})(9.80 \text{ m/s}^2)(20 \text{ m}) \)

\[ = -7.3 \times 10^2 \text{ J} \]

79. \( W_{nc} = \Delta E = E - E_o = [\frac{1}{2}mv_{0,y}^2 + mg(0)] - [\frac{1}{2}m(5.0 \text{ m/s})^2 + mg(10 \text{ m})] \)

So \( -2500 \text{ J} = [\frac{1}{2}(60 \text{ kg})(60 \text{ m/s})^2 + mg(0)] - [\frac{1}{2}(60 \text{ kg})(5.0 \text{ m/s})^2 + (60 \text{ kg})(9.80 \text{ m/s}^2)(10 \text{ m})] \).

Solving \( v_{0,y} = 12 \text{ m/s} \).

80. (b).

81. **No, paying for energy** because kWh is the unit of Power \( \times \) Time = Energy.

\( 2.5 \text{ kWh} = 2500 \text{ Wh} \times \frac{3600 \text{ s}}{1 \text{ h}} = 9.0 \times 10^3 \text{ J} \).