

45. Equation 8-31 provides $\Delta E_{\text{th}} = -\Delta E_{\text{mec}}$ for the energy “lost” in the sense of this problem. Thus,

$$\begin{aligned}\Delta E_{\text{th}} &= \frac{1}{2}m(v_i^2 - v_f^2) + mg(y_i - y_f) \\ &= \frac{1}{2}(60)(24^2 - 22^2) + (60)(9.8)(14) \\ &= 1.1 \times 10^4 \text{ J} .\end{aligned}$$

That the angle of 25° is nowhere used in this calculation is indicative of the fact that energy is a scalar quantity.