

84. With the potential energy reference level set at the point of throwing, we have (with SI units understood)

$$\Delta E = mgh - \frac{1}{2}mv_0^2 = m \left((9.8)(8.1) - \frac{1}{2}(14)^2 \right)$$

which yields $\Delta E = -12$ J for $m = 0.63$ kg. This “loss” of mechanical energy is presumably due to air friction.