43. (a) We take the initial gravitational potential energy to be $U_i = 0$. Then the final gravitational potential energy is $U_f = -mgL$, where L is the length of the tree. The change is

$$U_f - U_i = -mgL = -(25\,\text{kg})\left(9.8\,\text{m/s}^2\right)(12\,\text{m}) = -2.9 \times 10^3\ \text{J}\ .$$

(b) The kinetic energy is

$$K = \frac{1}{2}mv^2 = \frac{1}{2}(25\,\text{kg})(5.6\,\text{m/s})^2 = 3.9 \times 10^2\ \text{J}\ .$$

(c) The changes in the mechanical and thermal energies must sum to zero. The change in thermal energy is $\Delta E_{\text{th}} = fL$, where f is the magnitude of the average frictional force; therefore,

$$f = -\frac{\Delta K + \Delta U}{L} = -\frac{3.92 \times 10^2\,\text{J} - 2.94 \times 10^3\,\text{J}}{12\,\text{m}} = 210\ \text{N}\ .$$