38. The textbook notes (in the discussion immediately after Eq. 16-7) that the acceleration amplitude is $a_m = \omega^2 x_m$, where ω is the angular frequency and $x_m = 0.0020$ m is the amplitude. Thus, $a_m = 8000\,\mathrm{m/s^2}$ leads to $\omega = 2000$ rad/s.

(a) Using Newton's second law with $m = 0.010$ kg, we have

$$F = ma = m\left(-a_m \cos\left(\omega t + \phi\right)\right) = -(80\,\mathrm{N})\cos\left(2000t - \frac{\pi}{3}\right)$$

where t is understood to be in seconds.

(b) Eq. 16-5 gives $T = 2\pi/\omega = 3.1 \times 10^{-3}$ s.

(c) The relation $v_m = \omega x_m$ can be used to solve for v_m, or we can pursue the alternate (though related) approach of energy conservation. Here we choose the latter. By Eq. 16-12, the spring constant is $k = \omega^2 m = 40000$ N/m. Then, energy conservation leads to

$$\frac{1}{2}kx_m^2 = \frac{1}{2}mv_m^2 \quad\Longrightarrow\quad v_m = x_m\sqrt{\frac{k}{m}} = 4.0 \text{ m/s}\ .$$

(d) The total energy is $\frac{1}{2}kx_m^2 = \frac{1}{2}mv_m^2 = 0.080$ J.