1) $m = 3\,kg$ $\quad x = 16\,cm$ $\quad F = -kx \Rightarrow k = \frac{F}{x} = 1837.5\ N/m$

a) $2\pi f = \sqrt{\frac{k}{m}} \Rightarrow f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \boxed{1.25\,Hz}$

b) $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \boxed{0.88\,Hz}$

c) $\mathcal{E} = \frac{1}{2}k\,x_{max}^2 = \boxed{0.235}$

d) $V_{max} = x_{max}\,\omega = x_{max}\,2\pi f = \boxed{0.393\ m/s}$

2) $T = 2\pi\sqrt{\frac{L}{g}} = \boxed{2s}$

4) a) $V_{max} = x_{max}\,\omega = \boxed{0.495\ m/s}$

b) $a_{max} = x_{max}\,\omega^2 = \boxed{11.9\ m/s^2}$

c) $\omega = 2\pi f \Rightarrow f = \frac{\omega}{2\pi} = \boxed{1.58\,Hz}$

5) a) $\boxed{1.2\,m}$ $\quad$ b) $\omega = \frac{1}{2}$ $\quad \omega = 2\pi f \Rightarrow f = \frac{\omega}{2\pi} = \boxed{0.0796\,Hz}$

c) $\omega = \boxed{\frac{1}{2}\ rad/s}$ $\quad$ d) $\theta = \boxed{\pi/6}$ $\quad$ e) $T = \frac{1}{f} = \boxed{12.6\,s}$

f) $V_{max} = x_{max}\,\omega = \boxed{0.6\ m/s}$ $\quad$ g) $a_{max} = x_{max}\,\omega^2 = \boxed{0.3\ m/s^2}$

h) $1.2\cos\left(\frac{\pi}{6}\right) = 1.04\ m$

6) $T = 2\pi\sqrt{\frac{L}{g}} \Rightarrow L = \left(\frac{T}{2\pi}\right)^2 g = 1.313\,m$

$T = 2\pi\sqrt{\frac{1.313\,m}{3.86\,m/s^2}} = \boxed{3.66\,s}$

7) $m = 0.255\,kg \quad k = 222\,N/m \quad x_{max} = 0.15\,m$

a) $\omega = \sqrt{\frac{k}{m}} = 2\pi f \Rightarrow f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \boxed{4.7\,Hz}$

b) $\omega = 2\pi f = 29.5\,\frac{rad}{s}$

$v_{max} = \omega x_{max} = \boxed{4.43\,m/s}$

$a_{max} = \omega^2 x_{max} = \boxed{130.8\,m/s^2}$

c) $TOT = \frac{1}{2} m v_{max}^2 = \frac{1}{2} k x_{max}^2 = \boxed{2.5\,J}$

d) $2\,\frac{1}{2} k x^2 = \frac{1}{2} k x_{max}^2$

$x^2 = \frac{1}{2} x_{max}^2 \qquad x = \sqrt{\frac{1}{2} x_{max}^2} =$

$\boxed{0.106\,m}$