

5. a)  $x_m = ?$   $1 \text{ mm} = 1 \times 10^{-3} \text{ m}$

b)  $v_{\max} = ?$   $v_{\max} = \omega x_m$

$$\omega = 2\pi f = 2\pi(120)$$

$$v_{\max} = (240\pi)(1 \times 10^{-3})$$
$$= 0.75 \text{ m/s}$$

c)  $a_{\max} = ?$

$$a_{\max} = \omega^2 x_m = (240\pi)^2 (0.001)$$
$$= 568 \text{ m/s}^2$$

6. a)  $\omega = ?$        $m = 1 \times 10^{-20} \text{ kg}$        $\omega = 2\pi f = \frac{2\pi}{T}$   
 b)  $X_m = ?$        $T = 1 \times 10^{-5} \text{ s}$        $\omega = \frac{2\pi}{1 \times 10^{-5}}$   
                                   $V_{\max} = 1 \times 10^3 \text{ m/s}$        $\omega = 6.28 \times 10^5 \text{ rad/s}$

$$V(t) = -\omega X_m \sin(\omega t + \phi)$$

$\underbrace{\hspace{10em}}_{\text{max amount} = \text{ONE}}$

$$\therefore V_{\max} = \omega X_m$$

$$1 \times 10^3 = 6.28 \times 10^5 X_m$$

$$X_m = 1.59 \times 10^{-3} \text{ m}$$

10.  $T = ?$   $0.75 \text{ s}$

$f = ?$   $f = \frac{1}{T} = 1.33 \text{ Hz}$

$\omega = ?$   $\omega = 2\pi f = 2\pi(1.33)$   
 $\omega = 8.4 \text{ rad/s}$

1.  $T = ?$   $T = 0.5s$

$$f = ? = \frac{1}{0.5} = 2\text{Hz}$$

$$x_m = ? = 18\text{cm} = 0.18\text{m}$$

4.  $f = 3 \text{ Hz}$   
 $m = 1450 \text{ kg}$      $\omega = \sqrt{\frac{k}{m}} \quad \left( \text{or } T = 2\pi \sqrt{\frac{m}{k}} \right)$

$$\omega^2 m = k$$

$$[(2\pi)(3)]^2 (1450) = (k)(4)$$

$$515193 = (k)(4)$$

$$\boxed{128798 \text{ N/m} = k}$$

$f = ?$      $m = 1815 \text{ kg}$

$$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{128798}{1815}} = 16.8$$

$$f = \frac{\omega}{2\pi} = \frac{16.8}{2\pi} = \boxed{2.68 \text{ Hz}}$$