

Mark scheme for Support Worksheet – Topic 4, Worksheet 1

1 $T = \frac{1}{f} = \frac{1}{4.5} = 0.22 \text{ s}; \omega = 2\pi f = 28 \text{ s}^{-1}$ [2]

2 The acceleration (or net force) must be proportional to; and in the opposite direction to displacement. [2]

3 The acceleration is not in the opposite direction to displacement. [1]

4 $\omega^2 = 2$; hence $T = \frac{2\pi}{\omega} = 4.4 \text{ s}$ [2]

5 One of the main properties of simple harmonic oscillations is that the period does not depend on the amplitude. [1]

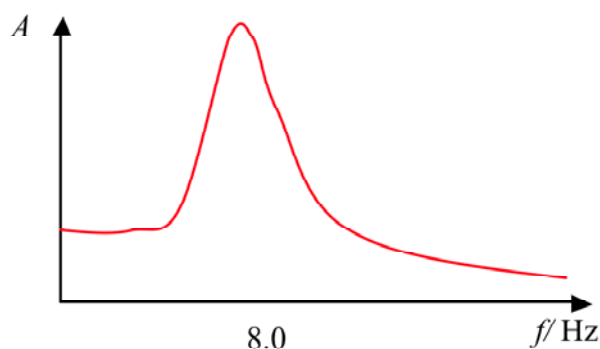
6 $x = 0.20 \cos\left(\frac{2\pi t}{0.12}\right)$ [1]

7 a $v_{\max} = x_0 \omega = 0.20 \times \frac{2\pi}{0.12} = 10.47 \approx 10 \text{ ms}^{-1}$ [1]

b $a_{\max} = x_0 \omega^2 = 0.20 \times \left(\frac{2\pi}{0.12}\right)^2 = 548 \approx 550 \text{ ms}^{-2}$ [1]

8 a $\omega^2 = \frac{2k}{m} = \frac{2 \times 802}{0.220} \Rightarrow \omega = 50.45 \text{ s}^{-1}; f = \frac{\omega}{2\pi} = \frac{50.45}{2\pi} = 8.0 \text{ Hz}$ [2]

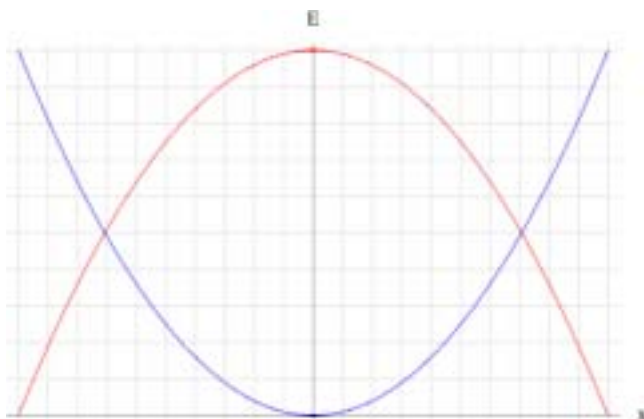
b See diagram. General shape; peak at 8.0 Hz.



[2]

c Amplitude would be reduced; frequency of peak would be less than 8.0 Hz. [2]

9 See curve in blue in the following graph.



[2]