Raffles Institution
Year 5-6 Physics Department

2025 Year 6 H2 Physics Remedial

Suggested Solutions

Chapter 10: Oscillations

1 **C** Use $a_{max} = \omega^2 x_o$; where ω^2 is the gradient of graph and $\omega = 2\pi / T$

2 **D**

3 **(a)** 48.00 cm = 0.4800 m (half smallest square → 2 d.p. for cm)

(b) $k = \dfrac{force}{extension} = \dfrac{mg}{x - l_{natural}} = \dfrac{(0.42 - 0.00)(9.81)}{(0.7000 - 0.4800)}$ = 18.7 N m^{-1}

(c) $\omega = \dfrac{2\pi}{T} = \dfrac{2\pi}{0.75} = 8.38$ rad s^{-1}

(d) **(i)** oscillations in the absence of an external force / with no loss or gain in total energy / constant amplitude

(ii)

$$-ky = ma$$
$$a = -\frac{k}{m}y$$
$$\omega^2 = \frac{k}{m}$$
$$m = \frac{k}{\omega^2} = \frac{18.7}{8.38^2} = 0.266 \text{ kg}$$

(iii)

$$mg = kx_e \Rightarrow x_e = \frac{(0.266)(9.81)}{18.7} = 0.14 \text{ m} = 14.0 \text{ cm}$$
$$x = x_e + l_{natural} = 0.140 + 0.4800 = 0.620 \text{ m}$$

OR
read from m_1 = 0.26 (nearest half square) → x = 0.615 to 0.625 m

4 **(a)** From 2nd graph, $v_0 = \omega x_0 = \dfrac{2\pi}{T} x_0$

$T = \dfrac{2\pi x_0}{v_0} = \dfrac{2\pi \times 0.45}{1.2}$ = 2.4 s

(b) From 1st graph, $F_{max} = m\omega^2 x_0$

$m = \dfrac{F_{max}}{\left(\dfrac{2\pi}{T}\right)^2 x_0} = \dfrac{0.63}{\left(\dfrac{2\pi}{2.36}\right)^2 0.45}$ = 0.20 kg

Chapter 11: Wave Motion

1 **A** In 2 s, the wave travels 1 cm → speed = 1 cm / 2 s = 0.5 cm s^{-1}

2 **B**

3 **A** Option A is the answer as when θ is 0°, the transmission axes are perpendicular to one another and hence no light passes through.
When θ is 90°, the axes are parallel to one another and maximum intensity of light passes through.
In between these two angles, the intensity transmitted increases.

4 **A** For Alice to hear the music as loud as before, the intensity of the sound reaching her ears should remain the same.

$$\frac{P}{4\pi(15)^2} = \frac{0.75P}{4\pi(x)^2}$$

$x = 13$ m

5 **(a)** Same frequency
Same period
Same type
Different amplitude / phase

(b) Yes. They have constant phase difference and are in anti-phase (phase difference of π rad).

(c) **(i)** $I \propto A^2$

$$\frac{I_B}{I_A} = \frac{A_B^2}{A_A^2} = \frac{2^2}{3^2}$$

$I_B = \frac{4}{9}$ I = 0.44 I

(ii) $I \propto A^2$

Since the two waves are in anti-phase, they will undergo destructive interference,
Resultant amplitude = 3 – 2 = 1 unit.

$$\frac{I_R}{I_A} = \frac{A_R^2}{A_A^2} = \frac{1^2}{3^2}$$

$I_R = \frac{1}{9} I = 0.11\ I$