

Revision Sheet

A-Level Physics · Unit 17 Oscillations

6 vocabulary items · 34 marks of exam questions (4 questions)

Part 1 · Vocabulary review answer key. Section A wants the exact English spelling.

Question	Answer	Marks
1	simple harmonic motion	1
2	angular frequency	1
3	damping	1
4	critical damping	1
5	resonance	1
6	natural frequency	1

7(a)	straight line through origin shows that a is proportional to x
	negative gradient shows that a is in opposite direction to x
7(b)(i)	$a_0 = \omega^2 x_0$ or $a = -\omega^2 x$ or $\omega^2 = -\text{gradient}$
	$\omega = \sqrt{(0.40 / 0.050)}$ $= 2.8 \text{ rad s}^{-1}$
7(b)(ii)	$k = \omega^2 L$ $= 2.8^2 \times 1.24$
	$= 9.7 \text{ m s}^{-2}$
7(c)	(increasing L causes) ω to decrease or energy ($= \frac{1}{2} m \omega^2 x_0^2$) $= \frac{1}{2} m k x_0^2 / L$ (and L increases)
	so amplitude increases

8(a)	acceleration (directly) proportional to displacement
	acceleration is in opposite <u>direction</u> to displacement
8(b)	$\omega^2 = 2k / m$ and $\omega = 2\pi f$
	$(2\pi f)^2 = (2 \times 130) / 0.84$
	$f = 2.8 \text{ Hz}$
8(c)(i)	resonance
8(c)(ii)	oscillator supplies energy (continuously)
	energy of trolley constant so energy must be dissipated or without loss of energy the amplitude would continuously increase

9(a)	acceleration and displacement are in opposite directions
9(b)(i)	$F = kx$ $= 8.0 \times (0.060 - 0.048)$ <i>or</i> $8.0 \times (0.060 + 0.048)$ <i>or</i> 8.0×0.012 <i>or</i> 8.0×0.108
	$\Sigma F = (8.0 \times 0.012) - (8.0 \times 0.108) = 0.77 \text{ N}$ or $\Sigma F = 0.864 - 0.096 = 0.77 \text{ N}$

9(b)(ii)	$a = \frac{F}{m}$ $= \frac{0.77}{0.25}$ $= 3.1 \text{ ms}^{-2}$
9(b)(iii)	$a = -\omega^2 x$ $\omega = \sqrt{\frac{3.1}{0.048}}$ $\omega = 8.04$
	$T = 2\pi / \omega$
	$T = 2\pi / 8.04$ $= 0.78 \text{ s}$
9(b)(iv)	(resultant) force halved and distance halved
	same T

10(a)	straight line through the origin shows that a is proportional to x
	negative gradient shows that a and x are (always) in opposite <u>directions</u>
10(b)(i)	$a = -\omega^2 x$ $\omega = \sqrt{(2A / 3Y)}$
10(b)(ii)	$v_0 = \omega x_0$ $= 3Y \times \sqrt{(2A / 3Y)}$ $= \sqrt{(6AY)}$
10(b)(iii)	$E = \frac{1}{2} m \omega^2 x_0^2$ $= \frac{1}{2} m \times (2A / 3Y) \times (3Y)^2$ $= 3mAY$
10(c)	$\omega = 2\pi / T$ $(\quad = 2\pi / 0.75)$
	$x = 1.8 \sin (8.4 t)$