Mark scheme

Sound

Physics 0625 · Questions from Paper 3 and Paper 4

Total marks

64

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
4	5	6	6	8	6	6	7	8	8	**64**

Question 1 [4]

1(a)	vibrations OR oscillations	
1(b)	20 to 20 000	**B1**
	hertz OR Hz	**B1**
1(c)	reaction time OR distance / time interval is too small	**B1**

Question 2 [5]

2 **(a)** **(i)** amplitude B1

(ii) wavelength B1

(b) **(i)** string moves air M1
backwards & forwards OR up & down
OR compressions & rarefactions A1

(ii) gets quieter/softer/less loud B1

[Total: 5]

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Question 3 [6]

3(a)	horizontal arrows by eye	**B1**
	arrows pointing in opposite directions	**B1**
3(b)	3rd box ticked *vacuum*	**B1**
3(c)(i)	value less than 20 000	**B1**
	Hz	**B1**
3(c)(ii)	sound with frequency above upper (frequency) limit of human hearing	**B1**
	Total:	**6**

Question 4 [6]

4 **(a)** speed = distance / time in words, symbols or numbers **OR** distance / speed C1

330 / 5000 C1

0.066 (s), allow 0.07 (s) (to one significant figure) A1

(b) man with hammer hears one sound
accept hears the sound almost instantly / first B1

other man hears two sounds **OR** 1 through air and 1 through rail B1
NOT hears two sounds, one is an echo

any one from:
hears sound through rail before sound through air
calculation of time difference between sounds
because (speed of sound) in metal/steel faster than (speed of) sound in air B1

[Total: 6]

Question 5 [8]

5 **(a)** **(i)** reflection OR wave bounces back M1
from large object/sea bed A1

(ii) speed = distance/time in any form C1
1500 × 0.8 C1
1200 (m) A1

(iii) 600 (m) OR ½ × candidate's **(ii)**, correctly evaluated B1

(b) line with positive gradient M1
straight line OR meets horizontal axis to right of graph origin A1 [8]

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Question 6 [6]

6(a)	sound with a frequency higher than 20 kHz	**B1**
6(b)	vibrations (of the wave / particles) are parallel to the direction of propagation	**B1**
6(c)(i)	(pulse of) ultrasound / sound / wave (sent into water) reflects from object	**B1**
	time to travel to object and back measured	**B1**
	depth = speed × time	**B1**

6(c)(ii)	any **one** from: • non-destructive testing of materials • medical scanning (of soft tissue)	**B1**

Question 7 [6]

7(a)	ultrasound	**B1**
7(b)	0.029 s	**A3**
	(distance travelled =) 22 × 2 **OR** 44 SEEN	C1
	$v = s / t$ OR (t =) s / v OR 44 / 1500	C1
7(c)	reflected wave is weaker / has smaller amplitude	**M1**
	fish is small(er) **OR** only small part of wave reflects off fish OR most of sound goes to seabed	**A1**

Question 8 [7]

8(a)(i)	300 – 360 m / s	**B1**
8(a)(ii)	20 Hz – 20 kHz	**B1**
8(b)(i)	v = f λ OR (f =) v / λ OR (a)(i) / 0.022 Correct answer: e.g. 330 m / s gives 15 000 Hz	**C1** **A1**
8(b)(ii)	Vertical dotted lines midway (by eye) between each pair of compressions OR to right or left of compressions shown with correct spacing (by eye)	**B1**
8(b)(iii)	(At rarefactions) molecules have above normal separation / far apart / spread out Pressure (of air) is below normal / low OR Molecules exert below normal / low pressure	**B1** **B1**
	Total:	**7**

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Question 9 [8]

9 **(a)** 15–25 Hz to 15 000–25 000 Hz / 15–25 kHz B1

(b) **(i)** (region) where air layers/molecules/particles are pushed together/moved together/ closer (than normal)
OR (region) where (air) pressure raised/air (more) compressed/more dense B1

(ii) (region) where air layers/molecules are pushed apart/far(ther) apart (than normal)
OR (region) where (air) pressure reduced/air expanded B1

(c) **(i)** (sound is) loud(er) OR volume (of sound is) increased B1

(ii) sound has a higher frequency/pitch OR higher note (heard) B1

(d) 3.5 – 1.9 OR 1.6 (s) seen OR $v = 2d/1.9$ C1
250×2 OR 500 (m) seen OR $v = (2d + 500)/3.5$ C1
(speed = 500 / 1.6 =) 312.5 m / s at least 2 sig. figs A1

[Total 8]

Question 10 [8]

10(a)	(speed of sound in air =) 330 m / s ⩽ value ⩽ 350 m / s **AND** (speed of sound in water) is faster	**B1**
10(b)	Yes **AND** (normal) human hearing range is 20 Hz to 20 kHz (and all dolphin sounds lie in this range)	**A2**
	Yes **AND** all the dolphin sounds are in the range of human hearing	C1

10(c)	Frequency kHz	amplitude	loudness	pitch	**B2**
	14	Large	**loud**	**high**	
	8	small	**soft / quiet**	**low**	
	one mark for each column correct				
10(d)	Particles				**B1**
10(d)	high pressure **AND** low pressure				**B1**
	Parallel				**B1**

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