Sound

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Properties of Waves including Light and Sound
Sub-Topic	Sound
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **57 minutes**

Score: **/47**

Percentage: **/100**

Question	Answer	Mark
1(a)	Method 1: Long distance / distance in field measured with the tape One student fires pistol at one end (of this distance) Student at other end starts stop-watch on seeing smoke / light from pistol and st / ops stop-watch on hearing sound of pistol speed = (measured) distance / (measured) time Method 2: Distance of 50 m or more from a vertical wall measured with the tape Student 1 fires pistol at this distance from the wall Student 2 standing next to student 1 starts stop-watch on hearing pistol and stops stop-watch on hearing echo speed = 2 × (measured) distance / (measured) time	 B1 B1 B1 B1 (B1) (B1) (B1) (B1)
(b)(i)	v = fλ OR (λ =) v / f OR 1500 / 200 7.5 m	C1 A1
(b)(ii)	1 (frequency) does not change 2 (speed) decreases	B1 B1
		Total: 8

2	**(a)**	**(i)**	**1.**	Mark amplitude with **X**	B1
			2.	Mark wavelength with **Y**	B1
		(ii)	**1.**	Amplitude increases <u>and</u> wavelength stays the same	B1
			2.	Amplitude stays the same <u>and</u> wavelength decreases	B1
	(b)			v = (total) distance / time OR d / t OR 2d / t in any form	C1
				d = 1500 × 0.054 / 2	C
				40 m OR 41 m	A1

[Total: 7]

3	**(a)**	**(i)**		(compression is a) region of higher pressure OR region where air layers/particles/molecules are closer	B1
		(ii)	**1.**	distance between (two successive / adjacent) compressions	B1
			2.	number of compressions (passing a point) per second / unit time OR number of compressions emitted per second/unit time	B1
	(b)	**(i)**		(f =) v / λ OR 340 / 0.0085 40 000 Hz OR 40 kHz	
		(ii)		frequency/pitch is above the upper threshold for human hearing / 20 kHz OR it is ultrasound	B1
		(iii)		(d =) vt in any form: words, symbols, numbers	C1
				41 m **or** 40.8 m	A

[Total: 8]

4 **(a** (in compressions) pressure higher OR molecules / atoms / particles close(r) together / (more) tightly packed B1

(b) $v = f\lambda$ in any form OR (λ =) v / f OR 340 / 850
= 0.40 m A1

(ii) distance (of compression A from barrier) = 2.5 × 0.40 OR 1.0 m C
time (to reach barrier) = 1 / 340 = 2.9×10^{-3} s OR 2.9 ms

OR T (= 1 / f) = 1 / 850 OR 0.4 / 340 OR 1.2×10^{-3} (C1)
(moves 2.5 wavelengths:) time = 2.5 / 850 = 2.9×10^{-3} s OR 2.9 ms (A

(c) two circular arcs centred on mid-point of gap in barrier by eye B1
along centre line, arcs separated by the same distance as adjacent compressions approaching barrier B1

(d) (speed in water) greater OR numerical value greater than 340 m / s B

[Total: 8]

5	**(a**	(region of) low(er) pressure OR where molecules are further apart	B1
	(b) **(i)**	0.19 m	B1
	(ii)	$v = f\lambda$ OR $7\,800 \times 0.19$ OR $1\,500 / 1\,480 / 1\,482$ (m / s) OR $0.76 / 1\,500$ OR $1 / 7\,800$ OR $4 / 7\,800$ etc. ecf from **(i)**	C1
		$5.1(28205) \times 10^{-4}$ s ecf from **(i)**	A1
	(c) **(i)**	unchanged / stays the same / constant OR 7 800 Hz	
	(ii)	increases	B1
	(d)	three wavefronts (rarefactions) joined to those below	B1
		three wavefronts with their upper ends further to the right AND parallel	B1

[Total: 8]

6	**(a**	speed of sound in gas: 300 m / s		B
		speed of sound in solid: 3000 m / s		B
	(b)	particles / molecules / atoms oscillate / vibrate OR pressure variation / compressions / rarefactions / displacements move		B1
		in the direction of travel (of the wave / sound)		
	(c)	**(i)** two complete wavelengths / cycles with shorter wavelength		B1
		wave drawn has greater amplitude		B1
		(ii) higher frequency / pitch		B1
		louder / higher volume		B1
				[Total: 8]