

Waves in Air-Fluids-Solids

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.6 Waves
Sub-Topic	Waves in Air-Fluids-Solids
Difficulty Level	Bronze Level
Booklet	Mark Scheme

Time Allowed: 57 minutes

Score: /57

Percentage: /100

Grade Boundaries:

M1.(a)	pitch	1
	loudness	1
(b)	(i) as length (of prongs) decreases frequency / pitch increases <i>accept converse</i> <i>accept negative correlation</i> <i>ignore inversely proportional</i>	1
	(ii) 8.3 (cm) <i>accept 8.3 ± 0.1 cm</i>	1
	(iii) (8.3 cm is) between 7.8 (cm) and 8.7 (cm) <i>ecf from part (ii)</i>	1
	(so f must be) between 384 (Hz) and 480 (Hz)	1
	$410 \text{ (Hz)} \leq f \leq 450 \text{ (Hz)}$ <i>if only the estimated frequency given, accept for 1 mark an answer within the range</i>	1
(c)	(i) electronic	1

- (ii) frequency is (very) high
*accept frequency above
20 000 (Hz) or audible range*

1

so tuning fork **or** length of prongs would be very small (1.2 mm)

1

- (d) 285.7 (Hz)
*accept any correct rounding 286, 290, 300
allow 2 marks for 285
allow 2 marks for correct substitution $0.0035 = 1 / f$
allow 1 mark for $T = 0.0035$ s
allow 1 mark for an answer of 2000*

3

[13]

M2.(a) (i) wavelength

*accept frequency
accept speed*

1

- (ii) amplitude
*accept energy
height is insufficient*

1

- (iii) sound

1

- (b) 0.12

*allow 1 mark for correct substitution, ie 8×0.015 provided no
subsequent step shown*

2

metre per second **or** m/s **or** metre/second

do **not** accept mps

units must be consistent with numerical answers

1

[6]

M3.(a) (i) bat(s)

1

(ii) any example in the inclusive range 5 ↔ 29 Hz / hertz

appropriate number and unit both required

1

(b) (i) A, C, D

all three required and no other

1

(ii) D, E

both required and no other

1

(c) sound cannot travel through a vacuum / (empty) space / free space

accept there is no medium (for the sound to travel through)

do **not** accept there is no air (for the sound to travel through)

1

(because) there is / are nothing / no particles to vibrate

accept because there is / are nothing / no particles between them and the source (of the sound)

1

[6]

M4. (a) (i)

correct order essential

(A =) a microphone

1

(B =) an oscilloscope

or cathode ray oscilloscope or CRO

1

(ii) the amplitude

accept any unambiguous indication

1

(iii) quieter / softer

*do **not** accept less (which could refer to the amplitude, frequency or wavelength)*

1

(b) sound cannot travel through a vacuum / (empty) space / free space

accept there is no medium for the sound to travel through

1

(because) there is / are nothing / no particles to vibrate

accept (because) there is / are nothing / no particles between them and the source (of the sound)

1

[6]

M5. (a) stop

accept any indication

cannot travel

2

(b) middle box ticked

accept a tick next to the statement even if not in the box
do **not** accept two ticks

1

(c) (i) B

highest frequency

accept most waves (in box)
accept 'squashed together'
do **not** accept 'squashed'
accept 'close (together)'
accept shortest wavelength

2

(ii) D

largest amplitude

accept tallest **or** highest wave
do **not** accept biggest wave
do **not** accept 'high' wave

2

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M6. (a) 4

1

(b) 3

1

(c) 3

correct answer with no working = 2
allow 1 mark for $f = \text{number} \div \text{time}$
or correct working i.e., $12 \div 4$
N.B. correct answer from incorrectly
recalled relationship / substitution = 0

2

Hz / hertz

accept HZ, hz, hZ
allow waves / cycles per second
allow wps, w/s, cps, c/s

1

[5]

- M7.** (a) Quality of written communication:
Correct use of 2 of the words, angle, critical, normal and reflection

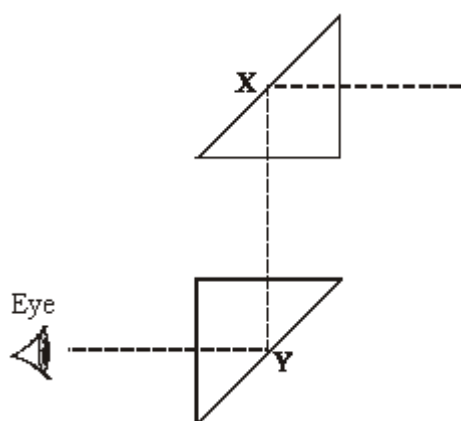
1

any **two** from

- light is reflected / bounces off
- if angle between ray and normal angle of incidence
- is greater than critical angle
- idea that no refraction bending if ray at 90°

2

(b)



1 mark for reflection at **X** if ray would reach the lower prism
1 mark for subsequent reflection at **Y**
1 mark for subsequent ray emerging from prism in direction of front of eye
accept dotted **or** dashed lines
ignore any arrows

3

[6]

M8.	(a)	(i)	cat	1
		(ii)	tuna	1
	(b)	(i)	ultrasound <i>allow ultrasonic</i>	1
		(ii)	cleaning / quality control / flaw detection / medical scanning / animal scaring / sonar	1

[4]

- M9.**
- idea that (in words or on diagram)
 - sound reflects / bounces off cliff
 - returns the way it came / produces an echo
each for 1 mark

[2]

M10. D

gains 1 mark

but E ($D + E = 1$)

gains 2 marks

[2]