

# Sound

## Mark Scheme 2

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 2

**Time Allowed:** 60 minutes

**Score:** /50

**Percentage:** /100

- 1 (a) longitudinal (2<sup>nd</sup> box) B1  
 frequency 100 – 10 000 Hz (6<sup>th</sup> box) B1  
 (note: –1 for e.e.o.o)
- (b) (i) reflection B1
- (ii) any two from: B2
- new wave(fronts/lets) generated
  - same speed **OR** frequency
  - angle of incidence = angle of reflection **OR** wavefronts make same angle (with boundary)
- (iii) no change B1
- (iv)  $v/\lambda$  **OR**  $v = f\lambda$  in any form C1  
 ( $f = 3.0/0.07 =$ ) 43 Hz A1

**[Total: 8]**

- 2 (a) 1500 m/s underlined/indicated
- (b) compression: closer together **AND** rarefaction: further apart B1
- compression: particles / molecules / wavefronts closer together / low pressure  
**AND** rarefaction: particles / molecules / wavefronts further apart / high pressure B1
- (c) (i) ( $t =$ )  $d/v$  used **OR**  $t = 2d/v$  **OR** 12 / 1500 **OR** 0.008 (s) C1  
 ( $t =$ )  $2d/v$  used **OR** 24 / 1500 A1  
 0.016 s
- (ii) amplitude: decrease B1  
 pitch: no change B1

**[Total: 8]**

- 3 (a) 15–25 Hz to 15 000–25 000 Hz / 15–25 kHz B1
- (b) (region) where air layers/molecules/particles are pushed together/moved together/  
 closer (than normal) B1  
 OR (region) where (air) pressure raised/air (more) compressed/more dense
- (ii) (region) where air layers/molecules are pushed apart/far(ther) apart (than normal) B1  
 OR (region) where (air) pressure reduced/air expanded
- (c) (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]**

- 4 (a) (i) 320-350 m/s condone 100 – 999 m/s B1
- (ii)  $3 \times 10^8$  m/s condone  $2 - 4 \times 10^8$  m/s [2]
- (b) use of  $v = f\lambda$  C1  
 correct evaluation of candidate's (a)(i)/1.2  
 (330 m/s gives 275 Hz) [2]
- (c) (i) correct evaluation of candidate's (a)(i) × 4.8 B1  
 (330 m/s gives 1584m)
- (ii) clear statement that light travels instantaneously o.w.t.t.e. B1  
 OR distance of thunderstorm same as distance travelled by sound  
 OR thunder and lightning caused by same event  
 OR negligible wind [2]

- 5 (a) compression B1  
rarefaction B1 [2]
- (b) cone moves forward / in direction of travel of wave B1  
OR cone pushes air particles closer o.w.t.t.e.  
cone moves backwards / away from direction of travel of wave B1  
OR cone causes empty spaces o.w.t.t.e. [2]
- (c) (i) loudness increases AND pitch same B1  
(ii) loudness same AND pitch increases B1 [2]

- 6 (a) idea of light travelling (much) faster than sound B1
- (b) (i) 4.0 (min) B1  
(ii) always a (measurable) time difference / never zero time difference B1  
Ignore time would be less  
(iii) distance/time in any form, symbols, words, numbers OR 1200/3.6 C1  
333.3 m/s to 2 or more sig figs A1  
(iv) idea of light travelling instantaneously OR no wind B1  
OR idea of lightning at ground level OR no obstruction to sound  
Ignore echoes

(c)

	light waves	sound waves
longitudinal		✓
transverse	✓	
electromagnetic	✓	
mechanical		✓

–1 e.e.o.o. i.e. 1 mark subtracted from 3 for each error or omission B3 [9]

- 7 (a) (i) approximately 330 m/s  
(correct order of magnitude) B1
- (ii)  $300 / 5000$  OR  $t = d/v$  NOT  $t = 2d/v$  C1  
0.06 s A1
- (b) sound through air and sound through steel NOT echo B1
- speeds in air and steel are different NOT if faster in air  
accept sound in steel/rail heard first B1 [5]