

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

[Total: 7]

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

[Total: 8]

- 3 (a) (i) 1. one normal to mirror drawn B1
 2. angle of incidence, labelled B1
- (ii) both reflected rays drawn B1
 2. construction lines to locate image, marked I B1
- (b) (i) dot marked C in correct position B1
- (ii) two circular arcs each joining correct points on barrier B1
 spacing of arcs same as spacing of incident waves B1

[Total: 7]

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

[Total: 8]

- 5 (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
 ignore time would be less B1
- (iii) distance/time in any form, symbols, words, numbers OR 1200/3.6
 333.3 m/s to 2 or more sig figs C1
 A1
- (iv) idea of light travelling instantaneously OR no wind
 OR idea of lightning at ground level OR no obstruction to sound
 ignore echoes B1

(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]

