

General wave properties

Mark Scheme 1

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

Time Allowed: 63 minutes

Score: /52

Percentage: /100

- 1 (a) clear attempt at semi circles, at least 3 [1]
same wavelength as incoming wavefronts, by eye [1]
- (b) speed \div wavelength or $20 \div 2.5$ or $v = f\lambda$ [1]
8 Hz or 8 s^{-1} or 8 waves/second [1]
- (c) candidate's (b) OR "the same" OR nothing [1]
- (d) low frequency signals have longer wavelength (than high frequency signals) OR [1]
high frequency signals have shorter wavelength
- low frequency signals / long wavelength signals diffract more OR [1]
low frequency / short wavelength signals diffract less
- 2 (a) (i) any value between 6 and 7 mm seen C1
26 \pm 2 mm OR 2.6 \pm 0.2 cm A1
- (ii) $v = f\lambda$ in any form OR ($f =$) $v \div \lambda$ OR $0.39 \div 0.026$ C1
= 15 Hz ecf (i) A1
- (b) at least 4 wavefronts showing refraction in correct direction B1
7 parallel wavefront lines continuous with those in fast region B1
- (c) unchanged / nothing B1

[Total: 7]

- 3 (a) (i) (number of complete) vibrations (of the strip) per second/unit time B1
- (ii) maximum displacement of end of strip from mid-position
OR XY OR ZY OR XZ $\div 2$ B1
- (b) (i) $(t =) d \div v$ OR $2d \div v$ C1
- 0.20 s OR 0.2 s A
- (ii) 0.60 s OR 0.6 s c.a.o. B1
- (c) (i) accept any value between 1.0 and 9.9×10^3 m/s B
- (ii) accept any value between 1.0 and 9.9×10^3 m/s B
- (d) $v = f\lambda$ in any form OR $v \div f$ C1
- correct evaluation from candidate's (c)(i) with unit, expect 0.016 m B
- 4 (a) pressure high/increased OR molecules/particles close(r/st together) B1
- (b) (i) 1.7 m B1
- (ii) $v = f\lambda$ in any form OR $(f =) v/\lambda$ OR $5/0.025$
200 Hz A1
- (c) three compressions at $23^\circ - 33^\circ$ to wall B1
constant and correct wavelength by eye
only scored if at $8^\circ - 48^\circ$ to wall B1
- (d) (wavelength) greater B1
change of speed correctly related to change of wavelength B1

[Total: 8]

- 5 (a) vibrations **OR** compressions **AND** rarefactions
- vibrations parallel to direction of travel (of wave energy)
OR compressions move in direction of travel (of wave energy) A1
- (b) (i) $(\lambda=v/f)$ **OR** 6100/7500 **OR** 6100/7.5
- 0.81(33333)m **OR** 813(33333)mm
- (ii) 1. decreases B1
2. same answer as 1. B1
- [Total: 6]**
-
- 6 (a) (i) longitudinal: oscillations/vibration of particles/molecules in direction of travel (of wave) B1
- transverse: oscillation/vibrations of particles/molecules perpendicular to direction of travel (of wave) B1
- (ii) 1. e.g. sound wave / compression wave on a spring B1
2. e.g. any named electromagnetic wave / ripples / water wave / wave on a stretched rope B1
- (b) use of $v = f\lambda$ in any form **OR** $(\lambda =) v/f$ **OR** 7200/30 **OR** 7.2/30
 240 m / 0.24 km A1
- (c) no sound heard / quieter sound B1
- medium/air required to transmit sound
- OR** sound does not travel through a vacuum B1
- [Total: 8]**

- 7 (a) (i) diffraction [1]
- (ii) 1 or 2 parallel waves (and part-circular ends) in outer harbour
NOT part-circular ends going down B1
3 part-circular waves, $>45^\circ$ each side by eye, in inner harbour
allow flat below gap
centred in gap, allow error up to 1λ vertically B1
wavelength constant throughout, must have 3 extra wavefronts, judged
along line of direction of wave travel in Fig. 5.1 B1 [3]
- (b) (i) refraction [1]
- (ii) at least 4 parallel, straight waves joined onto original waves B1
at least 3 straight waves, sloping down to the right OR with constant reduced λ B1 [2]

[Total: 7]