Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	• Fewer waves/cycles on screen (1)	Accept wavelength increases	1

Q2.

Question Number	Answer	Mark
	B $2\pi tf$	1
	Incorrect Answers: A – incorrect expression C– incorrect expression D – incorrect expression	

Q3.

Question Number	Answer	Mark
	B fd	1
	Incorrect Answers: A – incorrect expression C – incorrect expression D – incorrect expression	

Q4.

Question Number	Answer	Additional Guidance	Mark
	• Use of $f = \frac{1}{T}$ with $T = 125\ \mu s$ (1) • 8000 Hz (1)	Example of calculation $f = \frac{1}{1.25\times10^{-8}\ s} = 8000\ Hz$	2

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• He should have moved the microphone over more inphase positions (to determine multiple wavelengths) (1) • This would reduce the uncertainty in the value (for *d)* (dependent upon MP1) (1)	**Alternative:** MP1: move microphone between antiphase positions MP2: as it is easier to judge when waves are in antiphase (peak corresponds to a trough)	2

Q6.

Question Number	Acceptable Answer	Additional Guidance	Mark
	• No of divisions read from oscilloscope trace (1) • Use of time base setting (1) • Use of $f = 1/T$ (1) • Use of $v = f\lambda$ (1) • $v = 340\ m\ s^{-1}$ (1)	MP1: Must be for a recognised part of wave Example of calculation $T = 3 \times 0.20 \times 10^{-3}\ s = 6.0 \times 10^{-4}\ s$ $f = \frac{1}{6.0 \times 10^{-4}\ s} = 1.67 \times 10^{3}\ Hz$ $v = 1.67 \times 10^{3}\ s^{-1} \times 0.205\ m = 342\ m\ s^{-1}$	5

Q7.

Question Number	Acceptable Answers	Additional Guidance	Mark
(a)	• initially the waves are in phase (1) • as one detector moves there is a path difference (1) • they are in antiphase at the point shown because the detector has moved half a wavelength (or an odd multiple) (1)		**(3)**

Question Number	Acceptable Answers	Additional Guidance	Mark
(b)	• calculates distance moved by detector = 7.4 cm (1) • use of wavelength = distance / 9 (= 0.822 cm) (1) • use of $v = f\lambda$ (1) • v = 329 m s^{-1} to 2 or 3 sf (1)	<u>Example of calculation</u> Distance moved = 15.4 cm - 8.0 cm = 7.4 cm Wavelength = 7.4 cm / 9 waves = 0.822 cm v = 40 000 Hz × 0.00822 m = 329 m s^{-1}	**(4)**

Question Number	Acceptable Answers		Additional Guidance	Mark
(c)	• the pointer on the dial is about as thick as the interval between the scale markings	(1)		
	• this will cause a large uncertainty in measurements	(1)		
	OR			
	• there is a gap between pointer on the dial and the scale so there can be a parallax error	(1)		
		(1)		
	• this will introduce uncertainty in measurements	(1)		
	OR			
	• the frequency on the dial may differ from the output	(1)		
	• so there could be a <u>systematic</u> error			**(2)**