	Answer	Additional guidance	Mark
(ii)	12(0)(202)		(1)
	12(.0) (cm)		AO1.1

	Answer	Additional guidance	Mark
(iii)	a description to include		(2) AO1.2
	time a wave (crest) over a measured/fixed/known/stated distance (1)	measure how long it takes for a wave to travel a set distance	
		measure distance travelled in a stated time	
	use (speed =) <u>distance</u> (1) time		
	ALTERNATIVE METHOD		
	(determine frequency by measuring) the time taken for a set number of waves to pass a	(count) the number of waves in a specified time	
	point (1)	'measure frequency' is not sufficient for this mark	
	use (speed =) $f \times \lambda$ (1)	use (speed =) f x (0.)12	

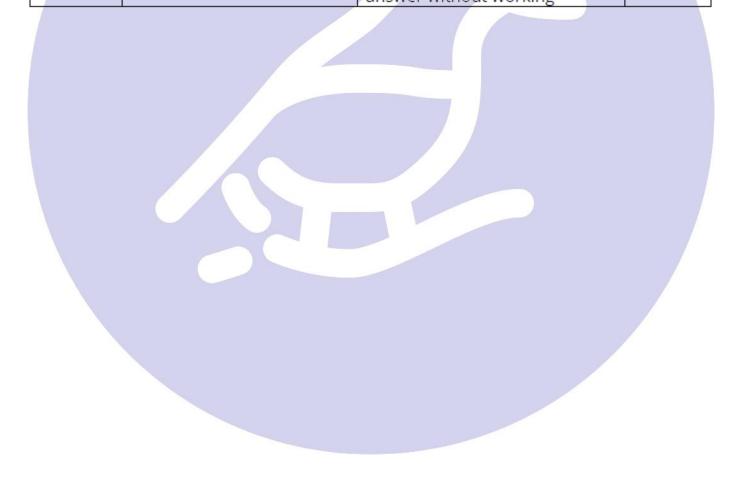
Question number	Answer	Additional guidance	Mark
	an explanation to include two from: waves cannot be seen (on arrival) (1) person will need another way of detecting the waves (1)		(2)
	(as) a person cannot count to 12 in one second / at a rate of 12 per second (1) frequency too high (1)	idea of coming too fast to count / easy to lose count	

Q3.

Question Number	Answer	Additional guidance	Mark
	an explanation linking: • measure across more than one (wavelength) (1)	use a more accurate device (finer divisions) use a camera / picture/strobe(light) (so the waves are not moving)	(2) AO 3 3b
	divide by the number of wavelengths (1)	wavelengths must be talking about measuring, NOT changing the wavelength etc.	

	Answer	Additional guidance	Mark
(i)	12		(1) AO1

	Answer	Additional guidance	Mark
(ii)	<u>42</u> (1) 12		(2) AO1
	3.5 (cm) (1)	ecf from2ai	
		allow 0.035 for 1 mark award full marks for the correct answer without working	



	Answer	Additional guidance	Mark
(iii)	A description to include:		(3) AO1
	either		
	time a crest/ripple/wavefront (1)	allow 'how long it takes' allow 'wave' for crest	
	(moving) between P and Q (1)	allow – over the 42 cm over a (set) distance	
	use (wave speed =) <u>distance</u> (1) time or		
	count number of crests		
	/		
	/ripples /wavefronts passing	allow waves	
	(eg P) (1)		
	in a given time (to find f) (1)		
	use (v =) fλ (1)		
		if no other mark scored measure frequency for 1	
		mark	

Question number	Answer	Additional guidance	Mark
(i)	a description to include		(3) AO1
	count the number of waves(1)		
	(arriving/passing a point) in a specific time(1)	ignore in one second	
	use frequency = <u>number of waves</u> time (1)	count the number of waves in one second scores 2 marks (MP1 and MP3)	
		find the time between one wave and the next scores 2 marks (MP1 and MP2)	

Question	Answer	Additional guidance	Mark
Number			
(i)	a description including		(2) AO1
	count the number of		
	waves/ripples (1)		
	(that pass a point) in a certain time (1)		
	OR		
	measure the time for a certain number of waves/ripples (1)		
	use of f = 1/T (1)		
		accept use of numerical	0
		values	
		calculate the number of waves that pass the point in a second scores 2 marks	

Question	Answer	Additional guidance	Mark
Number			
(ii)	a description including any two from		(2) AO1
(,	the waves/ripples are made to look stationary (1)	using camera, video, strobe light, stroboscope, mobile, phone, photo(graph)	
	measure the distance across a number of waves/wave fronts/ripples (1)	accept measure the distance across a number of lines	
	calculate the wavelength from the measurements (1)	divide distance by the number of waves/ripples	
		accept the idea of measuring the distance between one	
		wave/ripple/line and another (successive) wave/ripple/line for 2 marks	