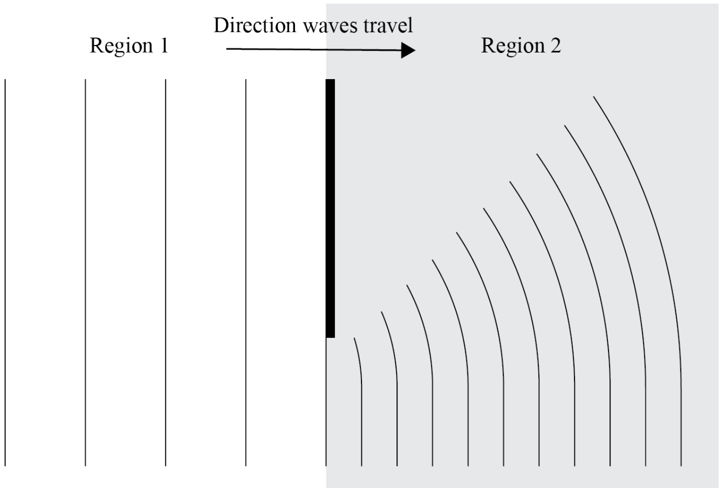
Assessment Schedule – 2019

Physics: Demonstrate understanding of aspects of wave behaviour (90938)

Evidence

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Amplitude = 12 cm or 0.12 m	• Correct answer.		
(b)(i)	Transverse wave.	• Transverse. OR Moving down. OR Moving perpendicular / vertically to direction of wave travel.	• Transverse. AND Moving down related to motion perpendicular to direction of wave travel/ trough approaching.	
(ii)	The mooring buoy is moving downwards. A transverse wave has motion perpendicular to the direction the wave is travelling. As the wave is moving to the left, the buoy will be moving vertically. At this point the trough immediately to the right of the buoy is approaching so the buoy must be moving downwards.			
(c)	5 crests = 4 wavelengths in 80 m, $\lambda = \frac{80}{4} = 20$ m $f = \frac{v}{\lambda} = \frac{5.60}{20} = 0.28$ Hz, $T = \frac{1}{f} = \frac{1}{0.28} = 3.57$ s OR $t = \frac{d}{v} = \frac{80}{5.60} = 14.29$ s, $T = \frac{t}{4} = \frac{14.29}{4} = 3.57$ s	• Uses 5λ to get $T = 2.86$ s (either method). OR Correct f (0.28 Hz). OR Correct t for wave to travel 80 m (14.29 s).	• Correct answer.	

(d)	(1) Wavelength decreases due to a decrease in wave speed. If *v* decreases while *f* remains constant λ must also decrease. (2) Decrease in v is due to a decrease in water depth. (3) Waves bend due to diffraction around the end of a barrier, which stops the top part of the wave.  • Waves diffract around barrier. • Shallower water → slower wave speed. • Slower wave speed → shorter λ, as constant *f*.	• Wavelength decreases. OR Waves slow down. OR Water becomes shallower. OR Waves bend / diffract. OR Barrier stated or drawn on diagram.	• Wavelength decreases due to decrease in speed. OR Speed decreases because of change in depth. OR Waves bend / diffract around the end of a barrier (barrier can be either stated or drawn on diagram, but must state that waves bend / diffract / etc).	• TWO of: - Wavelength decreases due to decrease in speed AND constant frequency. - Speed decreases because it shallower. - Waves bend / diffract around the end of a barrier (barrier can be either stated or drawn on diagram, but must state that waves bend / diffract / etc.).

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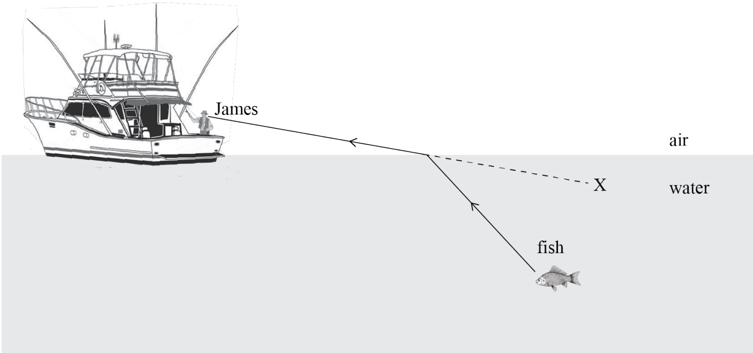
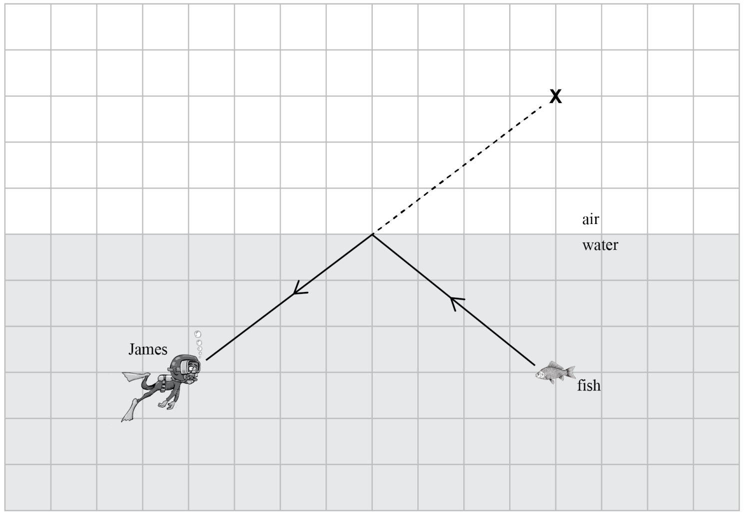
TWO (a)	Oscillation that transfers energy without overall transfer of matter.	• Transfers energy but not matter.		
(b)(i)	Longitudinal wave.	• Longitudinal. OR Correct statement of oscillation direction.	• Longitudinal. AND Correct statement of oscillation direction.	
(ii)	Particles vibrate / oscillate vertically / up and down / parallel to direction the wave travels. *Oscillation NOT "back & forth", "side to side", etc.*			
(c)(i)	As both frequencies have the same speed, the lower the frequency the longer the wavelength, so 50 kHz ultrasound has a longer wavelength than 200 kHz.	• 50 kHz has longer wavelength. OR Uses $f = 200$ leading to $\lambda = 7.5$ m OR $\lambda = 0.0075$ m	• 50 kHz has longer wavelength as it has lower frequency and same speed. AND $\lambda = 0.0075$ m	
(ii)	$\lambda = \frac{v}{f} = \frac{1500}{200\,000} = 0.0075 \text{ m}$			
(d)	$t_{\text{fish}} = \frac{d}{v} = \frac{2 \times 150}{1500} = \frac{300}{1500} = 0.20 \text{ s}$ $t_{\text{floor}} = \frac{d}{v} = \frac{2 \times 180}{1500} = \frac{360}{1500} = 0.24 \text{ s}$ $\Delta t = 0.24 - 0.20 = 0.04 \text{ s}$ OR Extra distance travelled by sound reflected from sea floor, $\Delta d = 2 \times 30 = 60 \text{ m}$ $\Delta t = \frac{\Delta d}{v} = \frac{60}{1500} = 0.04 \text{ s}$	• Correct return time for either fish or sea floor. OR Correct times for 1 way (0.1 s and 0.12 s).	• A correct method but does not account for return journey to give $\Delta t = 0.02$ s. OR Correct return times for both fish and sea floor.	• Correct answer.

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Refraction.	• Correct answer.		
(b)(i) (ii)		• Ray drawn from fish to James, bends correct direction. OR Diagram correct, but with lines.	• Rays drawn from fish to James, bends correct direction, diverging. AND Rays backtracked to 'X' (above fish).	
(c)		• Ray from fish to James reflecting from surface (approx. midway between). OR 'X' positioned correctly.	• Rays from fish to James reflecting off surface, diverging. AND 'X' positioned correctly.	

(d)	Total internal reflection. Angle of incidence is greater than the critical angle. Medium 1 / water has a higher optical density than medium 2 / air because it has a lower speed of light.	• Total internal reflection. OR Higher optical density to lower optical density. OR Lower speed of light to higher speed of light. OR Angle of incidence greater than critical angle.	• Total internal reflection. AND Higher to lower optical density. AND Angle of incidence greater than critical angle.	• Total internal reflection. AND Speed of light is lower in water than air. AND Angle of incidence greater than critical angle.

Judgement Statement

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No relevant evidence.	Very little evidence at the Achievement level. Most evidence is at the Not Achieved level.	Some evidence at the Achievement level; partial explanations.	Most evidence provided is at the Achievement level, while some is at the Not Achieved level.	Nearly all evidence provided is at the Achievement level.	Some evidence is at the Merit level, with some at the Achievement level.	Most evidence is at the Merit level, with some at the Achievement level.	Evidence is provided for most tasks, with evidence at the Excellence level weak or with minor errors / omissions.	Evidence provided for all tasks. Evidence at the Excellence level accurate and full.
No evidence.	1 × A	2 × A OR 1 × M	3 × A OR 1 × A + 1 × M OR 1 × E	4 × A OR 2 or 3 × A + 1 × M OR 2 × M OR 1 × A (or more) + 1 × E	1 × A + 2 × M OR 1 × M + 1 × E	2 × A + 2 × M OR 3 × M	1 × A + 1 × M + 1 × E	2 × M + 1 × E

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24