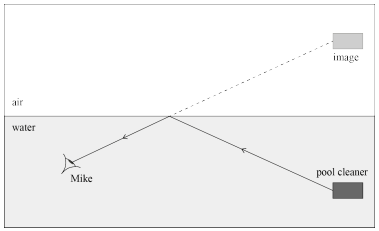
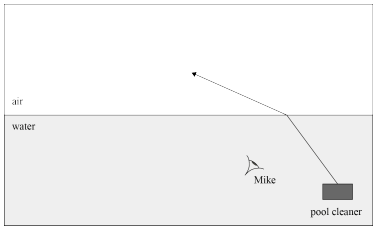
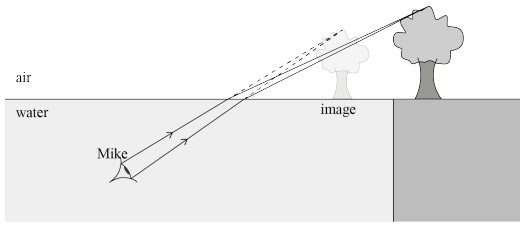
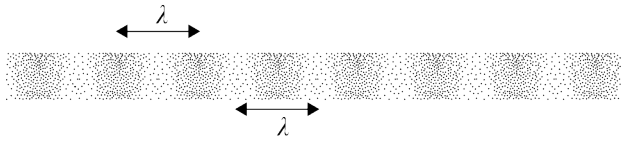
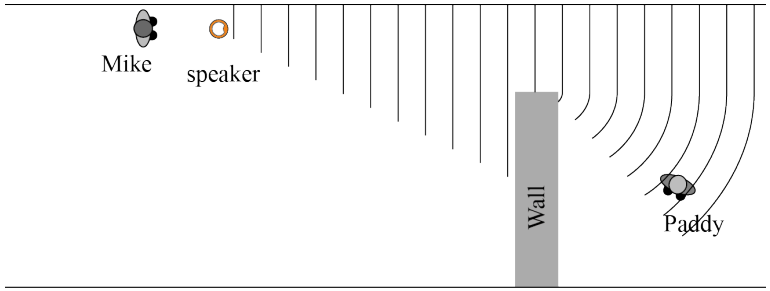
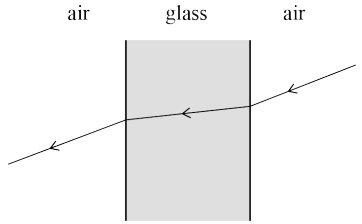
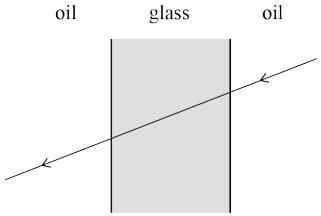
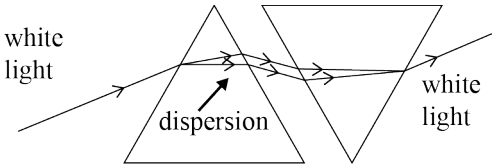
Assessment Schedule – 2017

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)(i)	Total internal reflection.	Total internal reflection named. OR Correctly drawn line from pool cleaner to Mike.	Total internal reflection named. AND Correctly drawn rays with location of image indicated correctly.	
(ii)				
(b)	Same size, (laterally) inverted, upside down, virtual.	Two correct properties.		
(c)	As Mike moves closer to the pool cleaner, the angle of incidence of the reflected ray decreases. Once Mike gets close enough to the pool cleaner, the angle of incidence is less than the critical angle for the water-air boundary, so the light passes out of the water into the air and is not reflected down to Mike, so he cannot see a reflection of the pool cleaner. 	angle of incidence decreases. OR Angle is less than critical angle. OR Light passes out of water. OR Reflection disappears (TIR doesn't happen). OR Correct refraction.	When Mike is closer to the pool cleaner light now passes out of water, due to angle of incidence being less than critical angle. OR When Mike moves closer to the pool cleaner, angle of incidence decreases, causing reflection to disappear due to angle being less than critical angle.	When Mike is closer to the pool cleaner light now passes out of water, due to angle of incidence being less than critical angle. OR When Mike moves closer to the pool cleaner, angle of incidence decreases, causing reflection to disappear due to angle being less than critical angle. AND Correct diagram.
(d)		Correctly drawn line from tree to Mike.	Correct drawn rays and image located correctly (in front of tree).	

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	 Longitudinal wave	Longitudinal. AND Correctly labels a wavelength on diagram.		
(b)	$t = \frac{d}{v} = \frac{2 \times 25}{1480} = 0.034$ s This is less than 0.1 s, so the echo would be indistinguishable from the original sound.	Correct method but did not double distance (t = 0.017 s) OR t = 0.034 s	Correct working, answer, and statement that the echo would be indistinguishable.	
(c)(i)	$\lambda = \frac{v}{f} = \frac{1480}{1500} = 0.987$ m = 98.7 cm	Correct answer in metres. OR Greater speed in water. OR Longer wavelength in water. OR Water is denser/closer packing.	Correct answer in centimetres. / $v_{water} > v_{air}$ / $\lambda_{water} > \lambda_{air}$ / Water is denser/closer packing **2/4**	Correct answer in centimetres. AND Sound waves travel faster in water due to increased wavelength with frequency being the same ($v = f\lambda$). OR Closer packing / density **causes** increase in speed.
(ii)	Since water is denser than air, sound waves will travel faster in water than in air. This is because the interaction between particles in the two media will occur more often in water, and hence the energy transfer (wave) will be faster. Alternatively, as the frequency is the same in both, the wavelength of sound in water will be greater than in air as the wave is faster in water and v = fλ.			
(d)	Sound waves diffract around the barrier, so some sound waves travel towards Paddy and he can hear the sound from the speaker. 	States diffraction. OR Draws a diagram illustrating diffraction.	Paddy could hear the radio because the waves diffracted around the barrier and travelled to him. AND Correct drawing of diffraction including constant wavelength, reaching Paddy.	

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Light slows down as it enters an optically more dense object.	Light slows down.		
(b)		Refraction towards normal at air-glass boundary shown. OR Refraction away from normal at glass-air boundary shown.	Correct diagram (rays in air are parallel)	
(c)	 As the oil and glass have the same optical density / speed of light, the ray of light does not refract as it passes from one medium to the other and it travels in a straight line. As the light does not refract at the edges / interfaces, the test tube cannot be seen.	Straight line drawn. OR Statement that as light does not refract / change direction.	Correct diagram. AND Statement that as light does not refract/change direction.	
(d)	 As the white light enters the first prism, it disperses into a spectrum of colours. The glass has a slightly different optical density / speed of light / refractive index for each colour / wavelength of light, which means different colours refract by slightly different amounts at the boundary. Red light refracts least, so will be at the top of the spectrum, while violet refracts the most so will be at the bottom of the spectrum as it exits the first prism. As the light passes through the second prism, the process is reversed and exits the second prism as white light.	Dispersion. OR Light refracts at a boundary, can be shown on diagram. OR After the first prism it will have spectrum of colours. Or After the second prism the light will be white.	Ray diagram through both prisms (>1 ray showing dispersion and recombination of spectrum). / Dispersion. / Spectrum after first prism. / White after second prism. / Different colours/frequencies/ wavelengths refract differently or travel at different speeds or have different optical densities / n. **3/5**	Correct ray diagram through both prisms (>1 ray showing dispersion and recombination of spectrum). / Dispersion. / Correct spectrum orientation. / White after second prism. **3/4** AND Spectrum after first prism due to correct difference in optical density / v / n of glass for different colours/ frequency / wavelength.

Question Sufficiency – All Questions

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1 × A	2 × A OR 1 × M	3 × A OR 1 × A + 1 × M OR 1 × E	4 × A OR 2 × A + 1 × M OR 2 × M OR 1 × A + 1 × E	1 × A + 2 × M OR 1 × M + 1 × E *(must have >1 M to get above A4)*	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 – 12	13 – 18	19 – 24