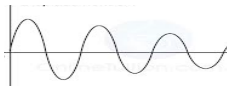
Assessment Schedule – 2014

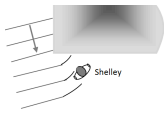
Physics: Demonstrate understanding of aspects of wave behaviour (90938)

Evidence Statement

Question	Achievement	Merit	Excellence
ONE (a)(i) & (ii)	ONE correct description given in part (i) or part (ii). Eg: • A wave is a disturbance (that travels from one location to another). • Waves transmit energy.	Waves transmit energy without carrying / transmitting matter. / Moving matter the entire distance	
(b)	(i) The correct directions are given. $\leftarrow\rightarrow$ OR (ii) The correct wavelength is calculated. There are 3 wavelengths in 2.7 m. $\lambda = \frac{2.7}{3} = 0.90$ m (m not required)	(i) The correct direction are given. $\leftarrow\rightarrow$ AND (ii) The correct wavelength is calculated. There are 3 wavelengths in 2.7 m. $\lambda = \frac{2.7}{3} = 0.90$ m (m not required)	
(c)	Speed of the wave in water is calculated correctly. Ie: $v = f\lambda = 10\times10^{3}\times0.153$ $= 1530$ m s^{-1} OR Calculated distance halved.	Speed of the wave in water is calculated correctly BUT Distance between the cliff and the transmitter is incorrectly calculated as 826 m (but not halved to get 413 m). OR Speed of the wave is incorrectly calculated using f with wrong/no multiplier of Hz to calculate the distance between the cliff and the transmitter is as, eg 0.413 m, 4.13 m, etc. OR $d = 413$ (with no unit or incorrect unit)	Distance between the cliff and the transmitter is correctly calculated. $v = f\lambda = 10\times10^{3}\times0.153$ $= 1530$ m s^{-1} $d = \frac{v\times t}{2} = \frac{1530\times0.54}{2}$ $= \frac{826}{2}$ $= 413$ m (correct unit required)

(d)	(i) At least two complete waves drawn with decreasing amplitude (irrespective of wavelength). OR (ii) Wave loses energy.	(i) At least two complete waves with same wavelength AND decreasing amplitude. OR (ii) Wave loses energy due to friction so amplitude is reduced. OR Energy is spread out over larger area so amplitude is reduced.	(i) **Exactly** two complete waves with same wavelength AND decreasing amplitude.  AND (ii) The wave loses energy due to friction/energy is spread out over a larger area which reduces the **intensity** of the wave so the amplitude becomes smaller.

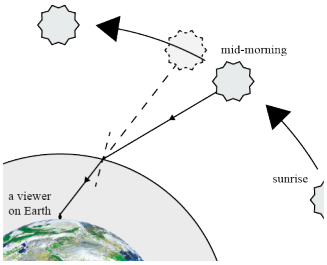
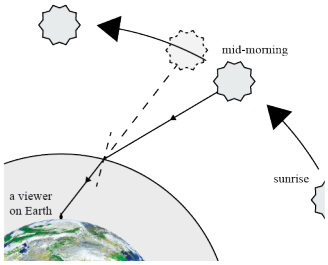
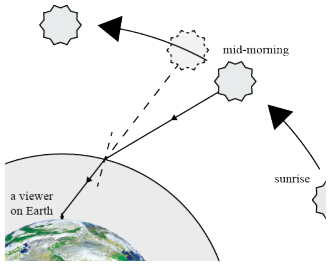
N0	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence	1a	2a	3a	4a	2m	3m	1e	2e

Question	Achievement	Merit	Excellence
TWO (a)	Diagram shows diffraction of sound wave – with diffraction towards Shelley ONLY.	 Diagram shows diffraction of sound wave – with diffraction towards Shelley ONLY clearly showing **no change** in **wavelength**.	
(b)	Identifies wavelength as a key factor, eg lower wavelength diffract more than shorter wavelength. OR Low frequency waves have a longer wavelength.	Low frequency waves have a longer wavelength. AND Diffraction is more pronounced with longer wavelengths (higher frequencies) than a with shorter wavelengths (higher frequencies).	Low frequency waves have a longer wavelength . AND Diffraction is more pronounced with longer wavelengths (higher frequencies) than a with shorter wavelengths (higher frequencies). SO The longer wavelengths **bend enough / sufficiently / more waves** reach Shelley (but the short wavelengths do not).
(c)	High frequency reaches Shelley as well as low frequencies. OR The sound heard from reflection is louder / clearer. OR Sounds of all frequencies will get to Shelley by reflection.	The sound heard from reflection is louder/clearer because she now hears both the reflected AND diffracted waves. OR Sounds of all frequencies will get to Shelley by **reflection** so she hears the high frequency sound louder/clearer than before.	

(d)	The amplitude of the waves stays (about) the same / both decrease / one decreases and one stays the same OR The change in direction of a reflected wave is abrupt / complete / bounces (back) and the a diffracted wave spreads out / bends.	The amplitude of the waves stays (about) the same/both decrease / one decreases and one stays the same AND The change in direction of a reflected wave is abrupt / complete / bounces (back) and the a diffracted wave spreads out / bends.	The amplitude of the waves stays (about) the same / both decrease / one decreases and one stays the same AND The change in direction of a reflected wave is abrupt / complete / bounces (back) and the a diffracted wave spreads out/bends AND One of the 4 ideas is explained, eg: • The change in direction of a reflected wave is abrupt / complete as the law of reflection is $i = r$.

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence	1a	2a	3a	4a	2m	3m	1e	2e

Question	Achievement	Merit	Excellence
THREE (a)	Either of: • Refraction • Dispersion		
(b)	(i) Top ray labelled as the red and 4th ray labelled as green. OR (ii) Light with different wavelengths / frequencies disperses / refracts by different amounts / different angles / travels at different speeds in glass.	(i) Top ray labelled as the red and 4th ray labelled as green. AND (ii) Different coloured light waves have different wavelengths / frequencies. AND Different wavelengths / frequencies refract by different amounts /travel at different speed in glass.	
(c)	(i) Total internal reflection. OR ONE of: • The ionised layer is optically less dense than the air above the Earth's surface. • The angle of incidence of B is greater than the critical angle (for this boundary). • The angle of incidence of A must be less than the critical angle.	(i) Total internal reflection. AND TWO of: • The ionised layer is optically less dense than the air above the Earth's surface. • The angle of incidence of B is greater than the critical angle (for this boundary). • The angle of incidence of A must be less than the critical angle.	(i) Total internal reflection. AND THREE of: • The ionised layer is optically less dense than the air above the Earth's surface. • The angle of incidence of B is greater than the critical angle (for this boundary). • The angle of incidence of A must be less than the critical angle.

(d)	ONE idea: • Correct refracted ray OR apparent position is drawn on diagram (tracing back of ray does not need to be shown).  • The Sun appears to be in a different position than where it really is in the morning. • The Sun appears to be in the same position as it really is at mid-day.	TWO of three ideas: • Correct refracted ray AND apparent position is drawn on diagram(tracing back of ray does not need to be shown).  • As the Sun rises it gets closer to its true position. • The Sun appears to be in the same position as it really is at mid-day.	ALL ideas correct: • Correct refracted ray AND apparent position is drawn on diagram(tracing back of ray **does** need to be shown).  • In the morning so the Sun is seen furtherest from its true position in the sky. • As the Sun rises it gets closer to its true position. • At mid-day the angle of incidence is zero / light travels along the normal / there is no refraction so the Sun appears in its true position.

N0	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence	1a	2a	3a	4a	2m	3m	1e	2e

Cut Scores

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 6	7 – 13	14 – 19	20 – 24