Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question Number	Answer	Additional guidance	Mark
	An explanation linking: make the distance between students larger (1) OR viable alternative method such as use microphones / sound sensors / datalogger (to start and stop timer) (1) **with:** to give a more measurable time (1) OR to remove (variable) reaction times (at start and end) / to reduce effect of reaction times / improve accuracy of timing (1)	50 m is too short (a distance to produce a measurable time) gives a longer time – more accurate measurement do not accept 'more accurate' without qualification for either method	**(2)**

Q2.

Question number	Answer	Additional guidance	Mark
	explanation linking: wave P refracts (towards the normal) (1) because P slows down (1) AND wave Q is reflected (at an equal angle from the boundary) (1) without change of speed of Q (1)	accept 'upper layer' for 'P' accept 'wavelength decreases' accept 'bends' for 'refracts' in this instance accept 'lower layer' for 'Q' accept 'wavelength unchanged' accept 'wave Q bounces off' (at an equal angle) allow one mark for refraction and reflection if no other mark awarded	**(4)**

Q3.

	Answer	Additional guidance	Mark
	an explanation linking: (refraction caused by) change in speed (1) sound speeds up (when entering water) (1) light slows down (when entering water) (1)	allow 3 marks for sound speeds up and light slows down (when entering water) allow 2 marks for sound speeds up (when entering water) OR light slows down (when entering water) if no other marks scored allow 1 mark for description of any speed change (when entering water) if no other marks scored allow 1 mark for wavelength changes ignore references to transverse, longitudinal.	**(3)** **AO1**

Q4.

Question Number	Answer	Additional guidance	Mark
	substitution (1) $\frac{3.0 (\times 10^{8})}{5.8 (\times 10^{-7})}$ evaluation (1) 5.2×10^{14} unit (1) Hz	 answers that round to 5.2×10^{14} award 2 marks for a correct answer without working allow 1 mark for answers that round to 5.2 to any power of ten independent mark accept hz or s^{-1} or per sec(ond) or hertz accept kHz, MHz etc with correct power (10^{11} kHz, 10^{8} MHz)	**(3)** AO 2 1

Q5.

Question Number	Answer	Additional guidance	Mark
	an explanation linking: (the colours have) different wavelengths (1) different wavelengths / colours travel at different speeds (1) so refract by different amounts (1)	 allow the word frequencies for wavelengths for refract allow bend/change direction/follow different path	**(3)** AO 2 1

Q6.

Question number	Answer	Mark
(i)	Any three of • sound waves are longitudinal but radio waves are transverse. • sound waves need a medium but radio waves travel through a vacuum. • sound waves have (much) lower velocity than radio waves. • sound waves have lower frequency / greater wavelength than radio waves • sound waves are vibrations but radio waves are electromagnetic waves.	(3)