Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(i)	substitution (1) % difference = $\frac{(240 - 343)}{343} \times 100$ evaluation (1) (-) 30 (%)	OR 343 – 240 in numerator award full marks for the correct answer without working allow 1 mark for division by 240 yielding 43% allow one mark for $\frac{240}{343} \times 100 = 70$ %	**(2)**

Question number	Answer	Additional guidance	Mark
(ii)	explanation linking any two of: reaction time is significant (with 0.5s or less) (1) the reaction time will be different for each of the students (1) effects on reaction times (1) students are at different distances (from starting pistol) (1) anticipation of flash / bang (1)	 accept reaction time is large compared with travel time differences in perception / acuity of light and sound	(2)

Question number	Answer	Additional guidance	Mark
(iii)	explanation linking: use a (much) longer distance **OR** use electronic timer (1) with effect (1) reduces/eliminates the significance/impact of the reaction time **OR** gives a more manageable time to measure	 all stand the same distance from the starting pistol (1)	(2)

Q2.

Question number	Answer	Additional guidance	Mark
	Substitution into $v = \frac{s}{t}$ to find v (1) $v = \frac{1.5 \times 10^{11}}{500}$ Substitution into $v = f \times \lambda$ and unit conversion (1) $v = \frac{1.5 \times 10^{11}}{500} = f \times 670 \times 10^{-9}$ Transposition (1) Rearrangement (1) $f = \frac{(1.50 \times 10^{11})}{500 \times (670 \times 10^{-9})}$ Answer (1) 4.5 x 10^{14} (Hz)	s is distance award full marks for correct numerical answer without working maximum 3 marks if λ in nm 4.4776 x 10^{14} (Hz)	**(4)**

Q3.

	Answer	Additional guidance	Mark
(i)	calculation of time of travel (1) (120/330 =) 0.36(36) (s) substitution (1) $\frac{0.23 \times 100}{0.36(36)}$ evaluation (1) 63 (%)	 ecf from MP1 for MP2&3 accept values that round to 64 or 63 accept values that round to 0.64 or 0.63 for 2 marks award full marks for the correct answer without working	(3) AO2

	Answer	Mark
(ii)	**C** Increase the distance between L and M. **A, B** and **D** are incorrect as these would not improve the technicians' measurement	(1) AO3

Q4.

Question number	Answer	Additional guidance	Mark
	recall **and** rearrangement (1) $\lambda = \frac{v}{f}$ evaluation (1) 3.08 (m) (so) length of aerial = 1.54 m (1) check working $\frac{3\times10^8}{2} = 1.5 \times 10^8$ gets only 1 mark for ecf	$\frac{3.0\ (\times 10^8)}{97.4\ (\times 10^6)}$ accept 3.1 (m) award 1 mark for wavelength that rounds to 3.1 to any other power of 10 independent mark. allow ECF from candidate's wavelength accept 1.5 (m) award 2 marks for 1.5 to any other power of 10 award full marks for the correct answer without working Allow 1.46 rounded to 1.5 for 1 mark only if it is ecf from mp2	**(3)**