Name of the Student:_____

Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	
(i)	An explanation that makes reference to the following points: **Either** • Take readings in different positions/orientations along the wire (and calculate a mean) (1) • As wire diameter may not be uniform (1) **OR** • Check (and correct for) for zero error (1) • Zero error reduces the accuracy of the measurement (1) Or Zero error moves the value away from the true value	**Accept:** use ratchet to close up micrometer to avoid squashing the wire MP2 accept cross section for diameter MP2: accept to reduce the effect of random error MP2 accept systematic error not changed by repeat measurements	2

Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
	EITHER • Plot a graph of L against $1/f$ **(1)** • $L = \lambda/4$ **(1)** • $L = \frac{v}{4f}$ so speed of sound = 4 × gradient **(1)** **OR** **(1)** • (Calculate λ using) $\lambda = 4L$ **(1)** • Plot a graph of λ against $1/f$ **(1)** • Speed of sound = gradient	Allow Plot a graph of L against $1/f$ $v = \frac{4}{\text{gradient}}$ Allow Plot a graph of f against $1/\lambda$	3

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Q3.

Question Number	Acceptable Answer		Additional Guidance	Mark
	• Determination of gradient	(1)	$T^2 = \frac{4\pi^2}{g} l$	
	• Re-arrangement of $T = 2\pi\sqrt{\frac{l}{g}}$	(1)	$T^2 = \frac{4\pi^2}{g}(h-d)$	
	• Algebra to show $T^2 = -\frac{4\pi^2}{g}d + \frac{4\pi^2}{g}h$	(1)	$T^2 = -\frac{4\pi^2}{g}d + \frac{4\pi^2}{g}h$	
	• Gradient = $(-)\frac{4\pi^2}{g}$	(1)	Example of calculation $\text{gradient} = \frac{(12.1-9.2)\ \text{s}^2}{(0.00-0.70)\ \text{m}}$	
	• g = 9.6 m s^{-2} [accept 9.5 → 9.7 m s^{-2}]	(1)	$= -4.1\ \text{s}^2\text{m}^{-1}$ $\therefore g = \frac{4\pi^2}{4.1\ \text{s}^2\text{m}^{-1}} = 9.6\ \text{m s}^{-2}$	5

Q4.

Question Number	Acceptable Answer		Additional Guidance	Mark
(i)	• discards value for l_3	(1)		
	• l_m=85.7 (cm)	(1)	MP2: answer to 1 d.p. only Example of calculation $l_m = \frac{85.5+86.0+85.5}{3} = 85.7$ cm	2
(ii)	• Use of $T = 2\pi\sqrt{\frac{\ell}{g}}$	(1)	ECF from (i) MP2: accept T = 1.9 s Example of calculation $T = 2\pi\sqrt{\frac{\ell}{g}}$ $= 2\pi \times \sqrt{\frac{0.857\ \text{m}}{9.81\ \text{m s}^{-2}}} = 1.86$ s	
	• T=1.86 s	(1)		2

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