

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none"> Difficult to identifying when sound was loudest Or Difficulty hearing tuning fork due to background noise (1) Tube moved when marking the water level Or Tube not vertical when water level was marked (1) 	2
2(b)(i)	<ul style="list-style-type: none"> Calculation of the mean using 5 values (1) Mean $l = 18.8$ cm to 3 s.f. (1) <p><u>Example of calculation</u> Mean $l = (18.4 + 18.0 + 19.2 + 19.4 + 19.2) / 5$ Mean $l = 18.8$ cm</p>	2
2(b)(ii)	<ul style="list-style-type: none"> Use of half the range (1) Percentage uncertainty = 4 (%) (1) <p>OR</p> <ul style="list-style-type: none"> Use of value furthest from the mean (18.0) Percentage uncertainty = 4 (%) <p>Allow ecf from 2(b)(i) for use of 4 values (e.g. ignoring 18.0) for both mark points.</p> <p><u>Example of calculation</u> Range = $19.4 - 18.0 = 1.4$ cm Percentage uncertainty = $(0.7 \text{ cm} / 18.8 \text{ cm}) \times 100 \% = 3.7 \%$</p> <p>Difference from mean = $18.8 - 18.0 = 0.8$ cm Percentage uncertainty = $(0.8 \text{ cm} / 18.8 \text{ cm}) \times 100 \% = 4.3 \%$</p>	2
2(c)	<ul style="list-style-type: none"> Use of $v = f\lambda$ (1) Speed of sound = 331 m s^{-1} (1) <p>Allow e.c.f from 2(b)(i)</p> <p><u>Example of calculation</u> $\lambda = 4 \times 0.188 \text{ m} = 0.752 \text{ m}$ $v = 440 \text{ Hz} \times 0.752 \text{ m} = 331 \text{ m s}^{-1}$</p>	2
2(d)	<ul style="list-style-type: none"> Use of percentage uncertainty from (b)(ii) to calculate relevant maximum/minimum value for speed of sound from (c) (1) Statement comparing this with 343 m s^{-1} (1) <p>MP1 – only needs to calculate one boundary – e.g. maximum if their value in (c) is below 343 m s^{-1}, minimum if (c) is above 343 m s^{-1}.</p> <p>OR</p> <ul style="list-style-type: none"> Calculates the percentage difference between 343 m s^{-1} and their speed of sound from (c) (1) Statement comparing this with their percentage uncertainty from (b)(ii) (1) <p><u>Example of calculation</u> Percentage uncertainty = 4 % $v = 331 \text{ m s}^{-1}$ Max $v = 331 \times 1.04 = 344 \text{ m s}^{-1}$</p>	2
Total for question 2		10