Question number	Answer	Notes	Marks
3 (a)	Any FIVE from: MP1. measure time for a set distance; MP2. realistic values suggested for experiment to work; MP3. suitable measuring instrument named; MP4. further detail of setup; MP5. idea of repeats **AND** average; MP6. speed = distance / time;	A fully labelled diagram can score all the marks. allow measuring wavelength for a known frequency e.g. • at least 1m for microphones and oscilloscope method • at least 100m for seeing and hearing a clap method • at least 50m for wall and echo method • wavelength measured at least 10cm e.g. stop clock, stopwatch, ruler, tape measure, oscilloscope, trundle wheel, timer e.g. • two microphones on bench connected to oscilloscope • start timing when see a clap and stop when hear it • clap by wall and time how long for clap to come back • moving a microphone until waveforms line up on oscilloscope • For echo method, idea time and distance is “there and back” allow speed = frequency × wavelength for appropriate method	5

(b) (i)	Measurement of one period on oscilloscope; Use of x-scale; Evaluation of period in s; e.g. Period = 4 squares Period = 4 x 0.25 (ms) Period = 1.0 x 10^{-3} (s)	 -1 POT error Allow 1 SF answer Condone period = 0.0005 (s) or 0.002 (s) or in standard form for 2 marks MAX.	3
(ii)	Substitution into given equation f = 1/ T; Evaluation; i.e f = 1/(1.0 x 10^{-3}) f = 1000 (Hz)	Allow ECF from b) (i)	2