

AS Level Physics A
H156/01 Breadth in Physics

Question Set 21

1 (a) You are provided with a rectangular block of plastic.

Describe how you can use a ray-box (or a laser beam), together with other equipment available in the laboratory, to accurately determine the refractive index of the plastic block.

[3]

(b) The speed of sound in air can be determined by forming stationary waves in the laboratory. Fig. 24.1 shows an arrangement used by a student to determine the speed of sound v .

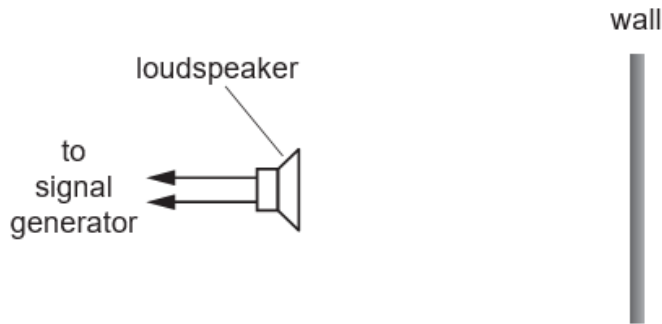


Fig. 24.1

A loudspeaker is placed in front of a smooth vertical wall in the laboratory. The loudspeaker is connected to a signal generator.

Stationary waves of frequency f are formed in the space between the wall and the loudspeaker.

A microphone is used to determine the mean separation L between adjacent nodes.

Fig. 24.2 shows the data plotted by the student.

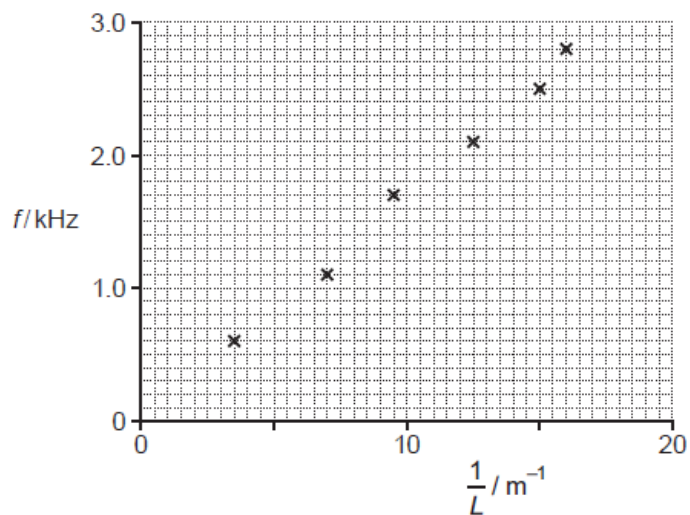


Fig. 24.2

(i) Draw a straight line of best fit and determine the gradient of this line.

gradient = _____ Hz m

[2]

(ii) Explain why the gradient of the line is $v/2$, where v is the speed of sound.

[2]

(iii) Use your answer in (i) and the information given in (ii) to determine v .

$v =$ ms^{-1}

[1]

(iv) The smaller values of L are much more difficult to determine with the microphone in this experiment and this produces large percentage uncertainty in the values of $\frac{1}{L}$.
Suggest how this percentage uncertainty may be reduced in this experiment.

[2]

Total Marks for Question Set 21: 10



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