

- 4 (a) (i) Define the *wavelength* of a progressive wave.

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[1]

- (ii) State what is meant by an *antinode* of a stationary wave.

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[1]

- (b) A loudspeaker producing sound of constant frequency is placed near the open end of a pipe, as shown in Fig. 4.1.

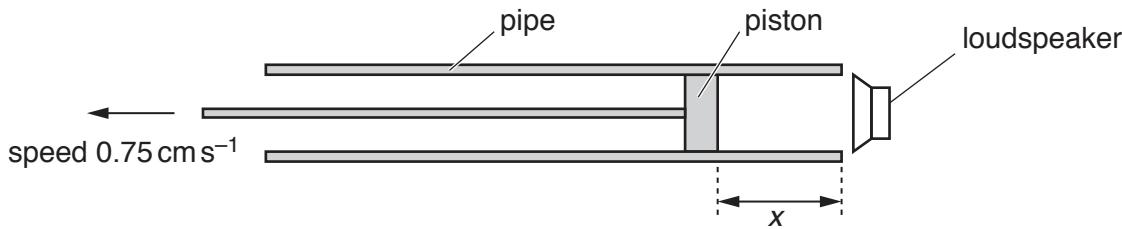


Fig. 4.1

A movable piston is at distance x from the open end of the pipe. Distance x is increased from $x = 0$ by moving the piston to the left with a constant speed of 0.75 cm s^{-1} .

The speed of the sound in the pipe is 340 m s^{-1} .

- (i) A much louder sound is first heard when $x = 4.5 \text{ cm}$. Assume that there is an antinode of a stationary wave at the open end of the pipe.

Determine the frequency of the sound in the pipe.

$$\text{frequency} = \dots \text{ Hz} [3]$$

- (ii) After a time interval, a second much louder sound is heard. Calculate the time interval between the first louder sound and the second louder sound being heard.

$$\text{time interval} = \dots \text{ s} [2]$$

[Total: 7]