

- 4 (a) State two features of a stationary wave that distinguish it from a progressive wave.

1. ....
  2. ....
- [2]

- (b) A long tube is open at one end. It is closed at the other end by means of a piston that can be moved along the tube, as shown in Fig. 4.1.

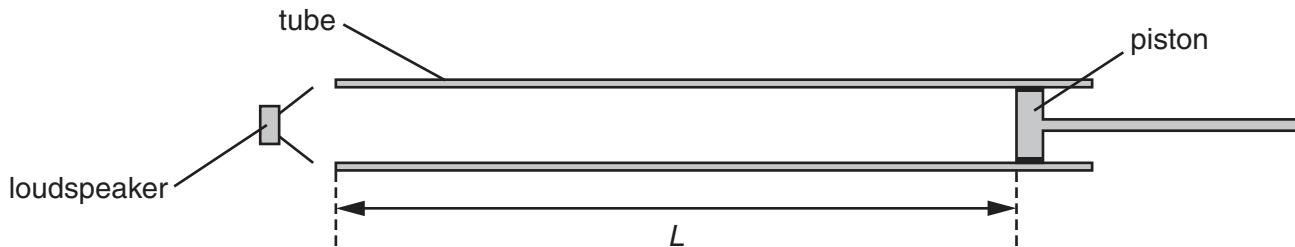


Fig. 4.1

A loudspeaker producing sound of frequency 550Hz is held near the open end of the tube.

The piston is moved along the tube and a loud sound is heard when the distance  $L$  between the piston and the open end of the tube is 45cm.

The speed of sound in the tube is  $330\text{ m s}^{-1}$ .

- (i) Show that the wavelength of the sound in the tube is 60cm.

[1]

- (ii) On Fig. 4.1, mark all the positions along the tube of

1. the displacement nodes (label these with the letter N),
2. the displacement antinodes (label these with the letter A).

[3]

**(c)** The frequency of the sound produced by the loudspeaker in **(b)** is gradually reduced.

Determine the lowest frequency at which a loud sound will be produced in the tube of length  $L = 45\text{ cm}$ .

frequency = ..... Hz [3]