6 A hollow tube is used to investigate stationary waves. The tube is closed at one end and open at the other end. A loudspeaker connected to a signal generator is placed near the open end of the tube, as shown in Fig. 6.1.

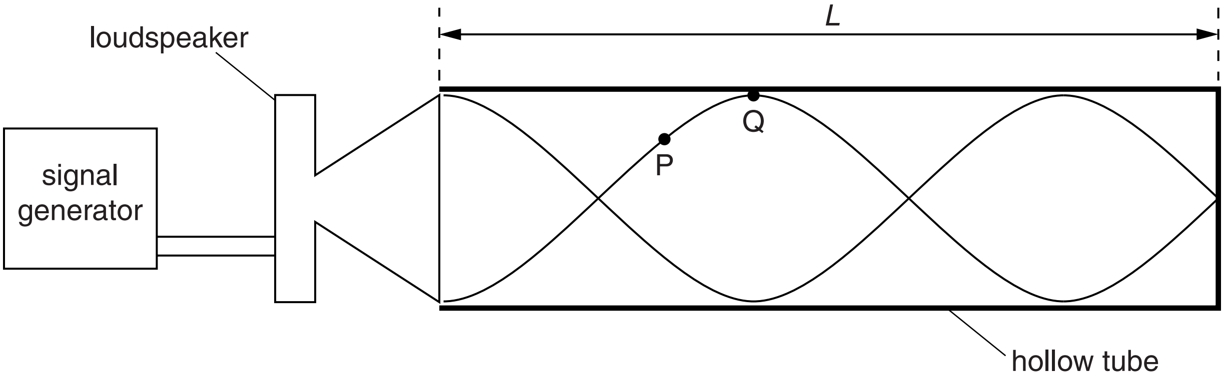

Fig. 6.1

The tube has length L. The frequency of the signal generator is adjusted so that the loudspeaker produces a progressive wave of frequency 440 Hz. A stationary wave is formed in the tube. A representation of this stationary wave is shown in Fig. 6.1.
Two points P and Q on the stationary wave are labelled.

(a) **(i)** Describe, in terms of energy transfer, the difference between a progressive wave and a stationary wave.

....

....[1]

(ii) Explain how the stationary wave is formed in the tube.

....

....

....

....[3]

(iii) State the direction of the oscillations of an air particle at point P.

....

....[1]

(b) On Fig. 6.1 label, with the letter N, the nodes of the stationary wave. [1]

(c) State the phase difference between points P and Q on the stationary wave.

phase difference = ... [1]

(d) The speed of sound in the tube is $330\,\mathrm{m\,s^{-1}}$.

Calculate

(i) the wavelength of the sound wave,

wavelength = ... m [2]

(ii) the length L of the tube.

length = ... m [2]