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.

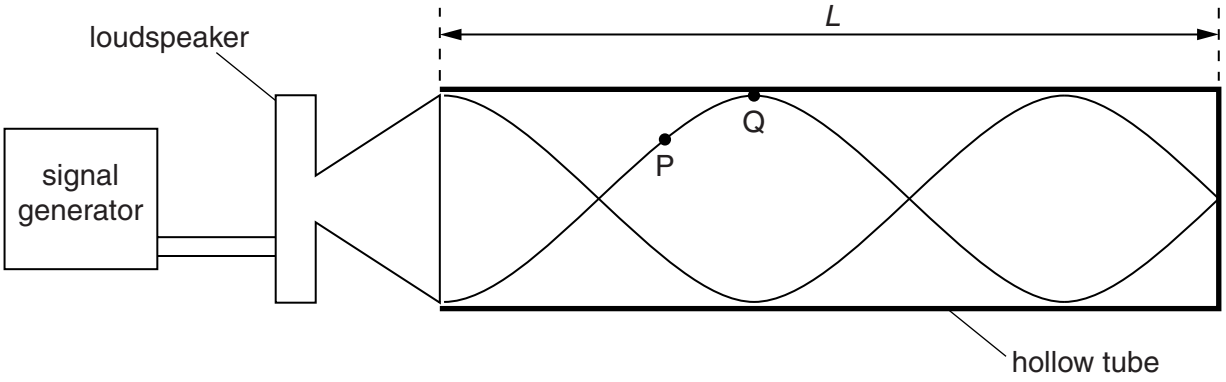

Fig. 6.1

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 m s^{-1}.

Calculate

(i) the wavelength of the sound wave,

wavelength = ... m [2]

(ii) the length *L* of the tube.

length = ... m [2]

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