5 **(a)** An arrangement for producing stationary waves in air in a tube that is closed at one end is shown in Fig. 5.1.

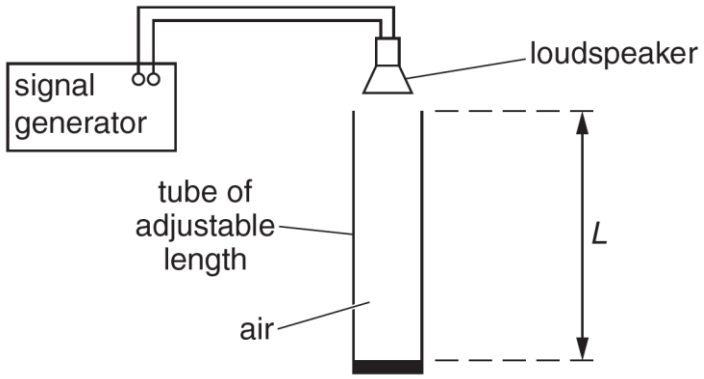

Fig. 5.1

A loudspeaker produces sound waves of wavelength 0.680 m in the tube.

For some values of length *L* of the tube, stationary waves are formed.

(i) Explain how stationary waves are formed in the tube.

.....

.....

.....[2]

(ii) The length *L* is adjusted between 0.200 m and 1.00 m.
Calculate one value of *L* for which stationary waves are formed. Ignore end corrections.

L = ... m [1]

(b) A horizontal string is stretched between two fixed points X and Y. The string is made to vibrate vertically so that a stationary wave is formed. At one instant $t = t_1$, each particle of the string is at its maximum displacement, as shown in Fig. 5.2.

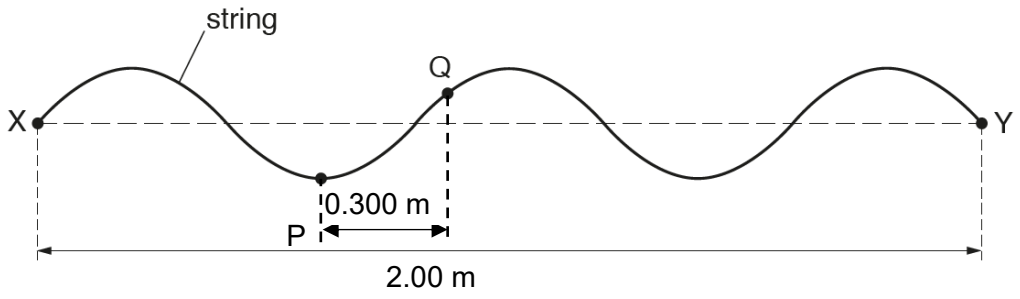

Fig. 5.2

P and Q are two particles of the string. The string vibrates with a frequency of 50 Hz. Distance XY is 2.00 m and horizontal distance between P and Q is 0.300 m.

(i) State the number of antinodes in the stationary wave.

number = ... [1]

(ii) Determine the phase difference between the vibrations of particle P and Q.

phase difference = …… [1]

(iii) On Fig. 5.2, sketch the position of the string between X and Y at times

1. t_1 + 10 ms (label this line M)

2. t_1 + 25 ms (label this line N)

[3]