3 Two loudspeakers X and Y face each other at a distance of 1.0 m apart, as shown in Fig. 3.1.

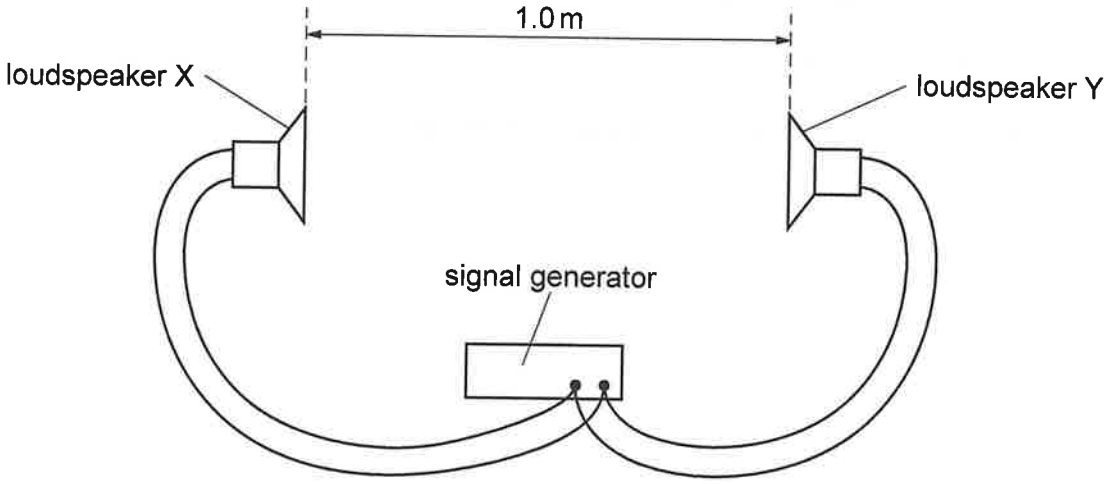

Fig. 3.1 (not to scale)

The loudspeakers are connected to the same signal generator. The loudspeakers emit sound of a single frequency.

A stationary wave is formed between the loudspeakers.

(a) (i) Explain why the two loudspeakers must be connected to the same signal generator for a stationary wave to form.

.....

.....

..... [1]

(ii) Describe an experiment to determine a value for the wavelength of the sound. Include:

- the apparatus used
- the measurements taken.

.....

.....

.....

.....

.....

..... [3]

(b) The wavelength of the sound is 0.40 m. The speed of the sound is 340 m s^{-1}.

(i) Calculate the frequency of the sound.

frequency = ... Hz [1]

(ii) The distance from loudspeaker X along a horizontal line joining the centres of loudspeakers X and Y is *d*.

You may assume that the amplitudes of the sound waves emitted by each of the loudspeakers remain constant over the distance between the loudspeakers, as shown in Fig. 3.2.

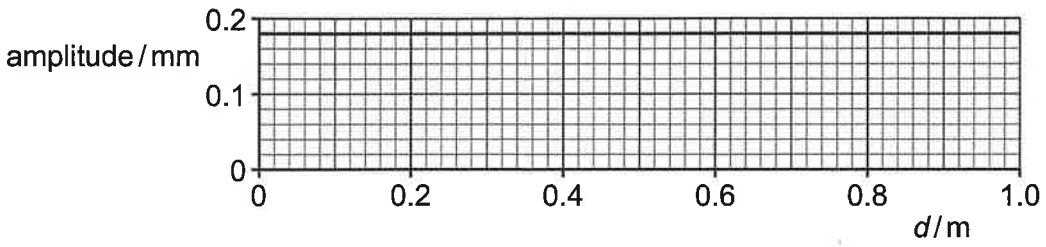

Fig. 3.2

On Fig. 3.3, sketch a line to show the variation with *d* of the amplitude of the stationary wave between the loudspeakers.

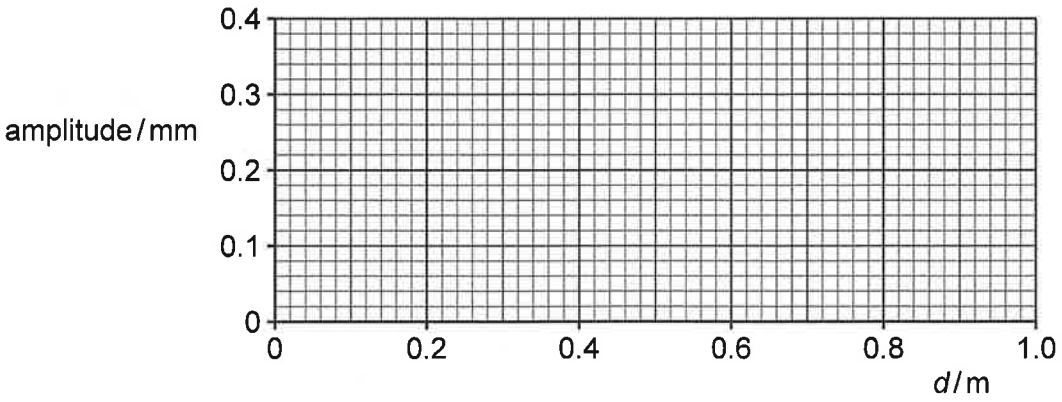

Fig. 3.3

[3]

[Total: 8]