6 **(a)** State the *principle of superposition*.

.....

.....

.....[2]

(b) An arrangement that can be used to determine the speed of sound in air is shown in Fig. 6.1.

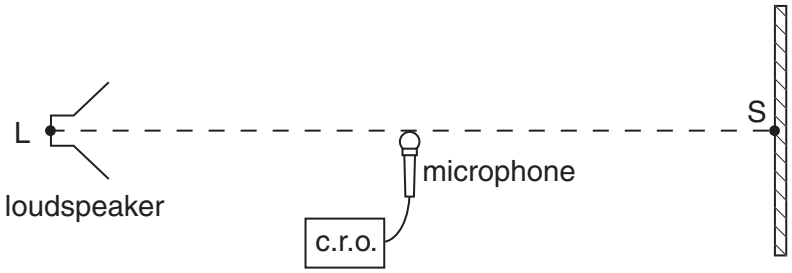

Fig. 6.1

Sound waves of constant frequency are emitted from the loudspeaker L and are reflected from a point S on a hard surface.
The loudspeaker is moved away from S until a stationary wave is produced.

Explain how sound waves from L give rise to a stationary wave between L and S.

.....

.....

.....[2]

(c) A microphone connected to a cathode ray oscilloscope (c.r.o.) is positioned between L and S as shown in Fig. 6.1. The trace obtained on the c.r.o. is shown in Fig. 6.2.

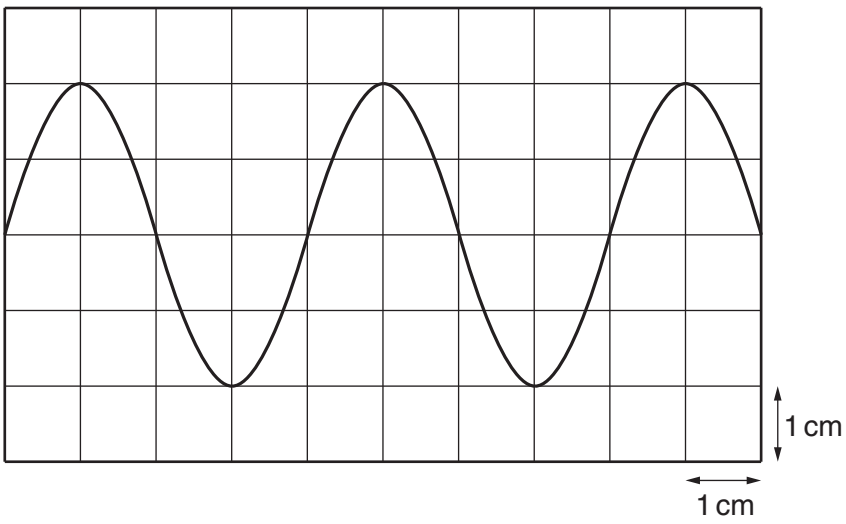

Fig. 6.2

The time-base setting on the c.r.o. is 0.10 ms cm^{-1}.

(i) Calculate the frequency of the sound wave.

For Examiner's Use

frequency = ... Hz [2]

(ii) The microphone is now moved towards S along the line LS. When the microphone is moved 6.7 cm, the trace seen on the c.r.o. varies from a maximum amplitude to a minimum and then back to a maximum.

1. Use the properties of stationary waves to explain these changes in amplitude.

.....

.....

.....[1]

2. Calculate the speed of sound.

speed of sound = ... $m\,s^{-1}$ [3]

Please turn over for Question 7.