4 (a) A student investigates a sound wave with a frequency of 25 000 Hz.

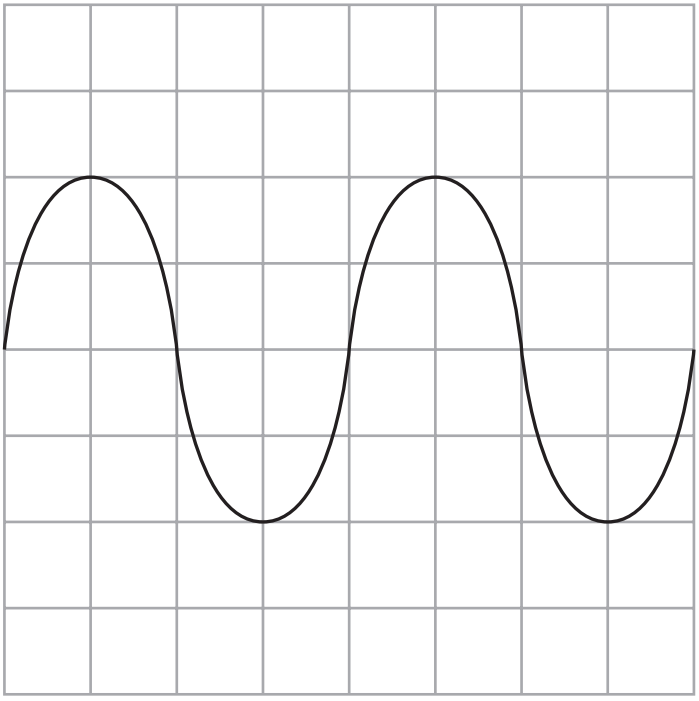
(i) Calculate the wavelength of this sound wave.

[speed of sound = 330 m/s]

(3)

wavelength = ... m

(ii) The oscilloscope trace represents the sound wave.



Oscilloscope settings

y direction: 1 square = 5 V

x direction: 1 square = 0.01 ms

Determine the amplitude of the oscilloscope trace.

(2)

amplitude = ... V

(b) (i) Diagram 1 shows a coil of wire wrapped around a cardboard tube.

The coil is fixed to the cardboard tube.

On diagram 1, draw field lines to represent the magnetic field produced when the current is in the direction shown.

(3)

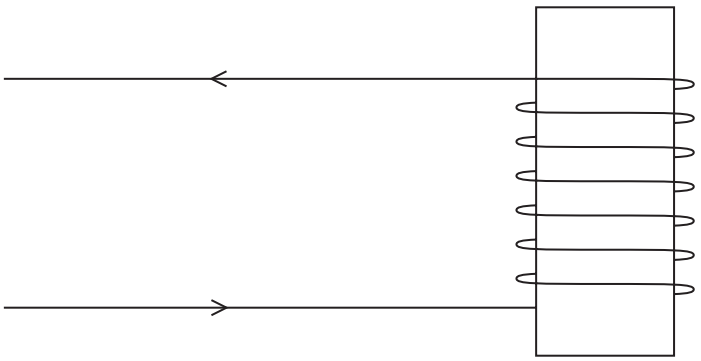


Diagram 1

(ii) Diagram 2 shows a model of a loudspeaker that uses the coil and the cardboard tube.

The cardboard tube is fixed to a thin piece of card, which is clamped at both ends.

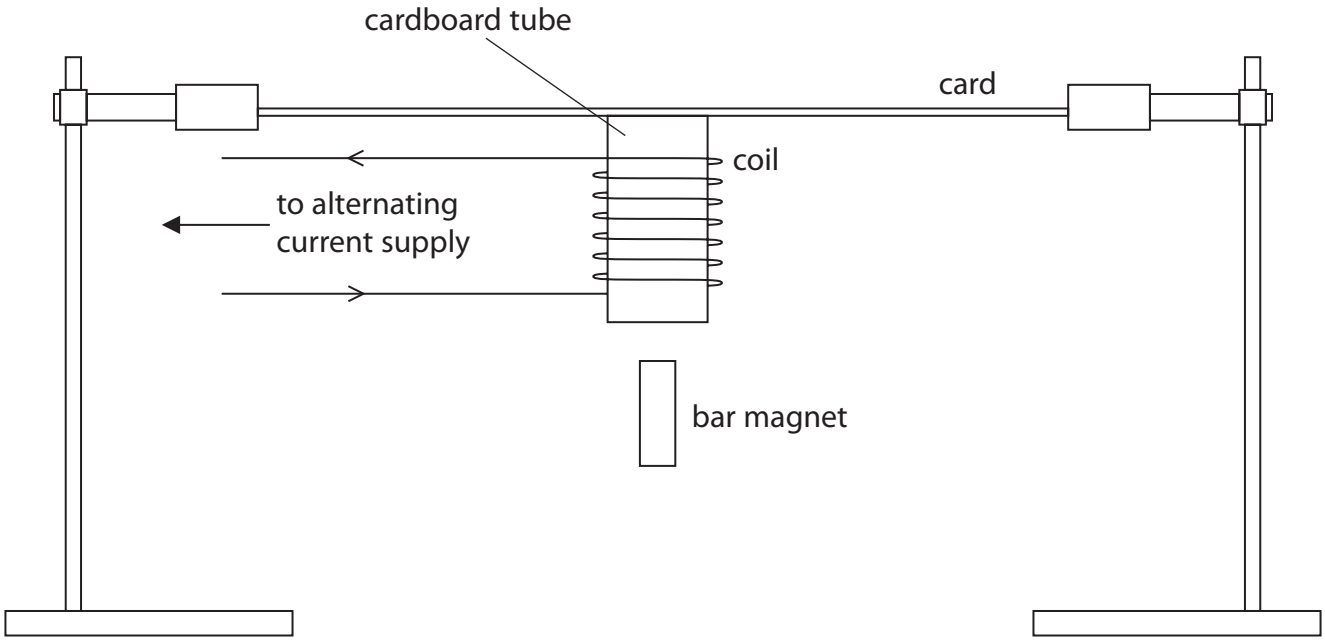


Diagram 2

The student holds a bar magnet near the bottom of the cardboard tube.

Explain why this causes the loudspeaker to produce a sound.

(3)

(iii) When the frequency of the alternating current is 10 kHz, the student hears a sound.

The student increases the frequency of the alternating current to 25 kHz.

Explain why the student cannot hear a sound now, even though the card is still vibrating.

(2)

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(iv) Suggest a change to the apparatus that would increase the loudness of the sound when the frequency of the alternating current is 10 kHz.

(1)

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(Total for Question 4 = 14 marks)

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