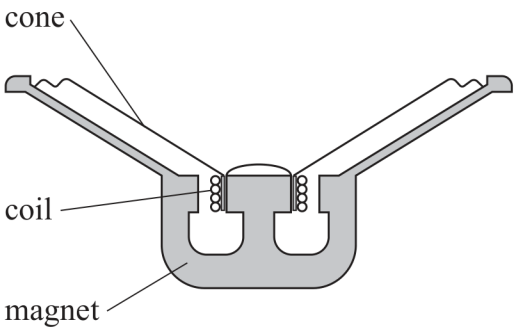
17 A music system has a number of loudspeakers. One loudspeaker produces the low frequency sounds. This loudspeaker consists of a coil connected to a cone. The coil is in a region of magnetic field produced by a permanent magnet, as shown.



(a) Explain how an alternating current in the coil causes the cone to oscillate with the frequency of the alternating current.

(3)

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(b) A signal of constant frequency is applied to the loudspeaker. The coil moves with simple harmonic motion and the loudspeaker emits a sound of frequency 75 Hz.

When the loudspeaker is producing this sound, the coil moves through a maximum distance of 3.5 mm.

(i) Calculate the maximum velocity of the coil.

(3)

Maximum velocity of the coil = ...

(ii) State the position of the coil when the velocity is a maximum.

(1)

(c) At a particular frequency, the loudspeaker cone starts to oscillate with a very large amplitude.

Explain why this effect is observed.

(2)

(Total for Question 17 = 9 marks)