4 **(a)** **(i)** Define the *wavelength* of a progressive wave.

.....

.....[1]

(ii) State what is meant by an *antinode* of a stationary wave.

.....

.....[1]

(b) A loudspeaker producing sound of constant frequency is placed near the open end of a pipe, as shown in Fig. 4.1.

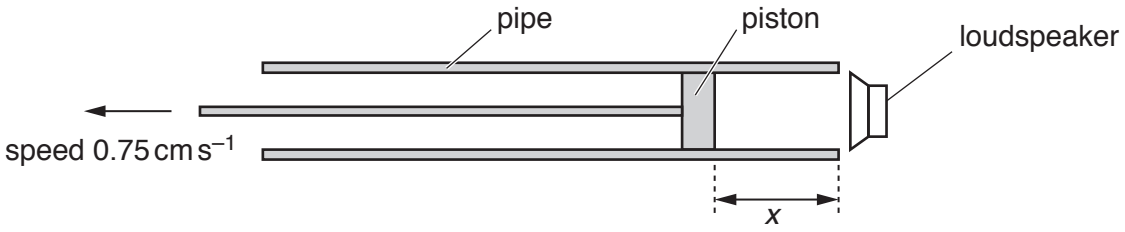

Fig. 4.1

A movable piston is at distance x from the open end of the pipe. Distance x is increased from $x = 0$ by moving the piston to the left with a constant speed of 0.75 cm s^{-1}.

The speed of the sound in the pipe is 340 m s^{-1}.

(i) A much louder sound is first heard when $x = 4.5$ cm. Assume that there is an antinode of a stationary wave at the open end of the pipe.

Determine the frequency of the sound in the pipe.

frequency = ... Hz [3]

(ii) After a time interval, a second much louder sound is heard. Calculate the time interval between the first louder sound and the second louder sound being heard.

time interval = ... s [2]

[Total: 7]