

- 4 (a) A speaker emits sound waves uniformly in all directions. Fig. 4.1 shows the variation with time  $t$  of the displacement  $x$  of an air molecule at a point Q that is 120 cm from the speaker.

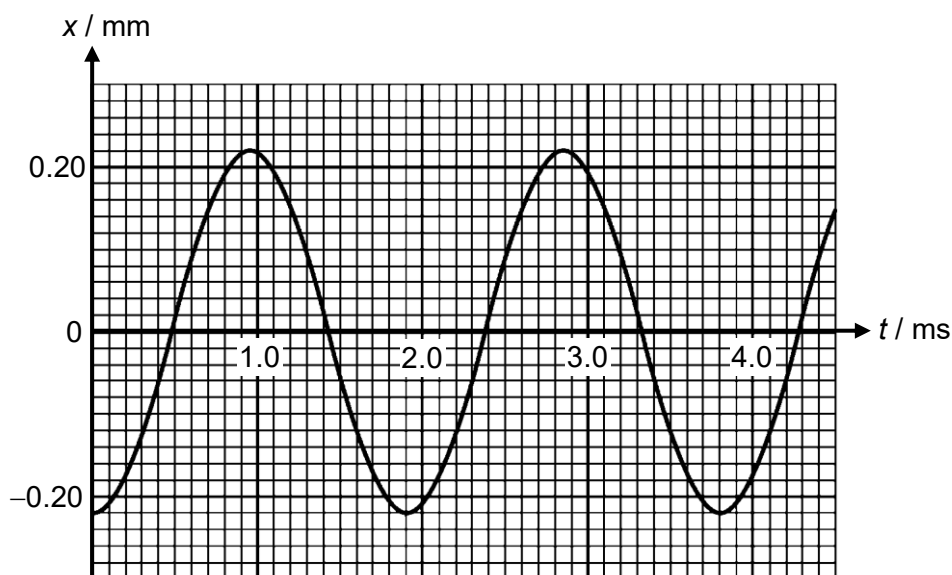


Fig. 4.1

- (i) Use Fig. 4.1 to determine the frequency  $f$  of the sound waves,

$$f = \dots\dots\dots \text{ Hz} \quad [2]$$

- (ii) Determine the next earliest time after 1.5 ms when the motion of the air molecule at Q has a phase difference of  $\frac{4}{5}\pi$  rad compared to its phase at 1.5 ms.

time = ..... ms [2]

- (iii) If the power of the speaker is reduced to 0.25 of its initial value, calculate the distance from the speaker that will have the same intensity as that at point Q.

distance = ..... m [2]

- (b) The wave arriving at point Q is progressive in nature. A stationary wave may be formed when two identical waves travelling in opposite directions superpose.

State the differences between the particles of a progressive wave and particles of a stationary wave in the following aspects:

- (i) amplitude,

.....  
.....  
..... [1]

- (ii) phase.

.....  
.....  
..... [1]

[Total: 8]