

- 5 (a) Use the definitions of speed v , frequency f and wavelength λ to derive the wave equation

$$v = f\lambda.$$

[2]

- (b) A source of sound waves of frequency 236 Hz is travelling at a constant velocity of 20 ms^{-1} .

A stationary observer has a microphone connected to a cathode-ray oscilloscope (CRO). The microphone detects the sound waves as the source moves directly towards the observer.

The resulting trace on the CRO is shown in Fig. 5.1.

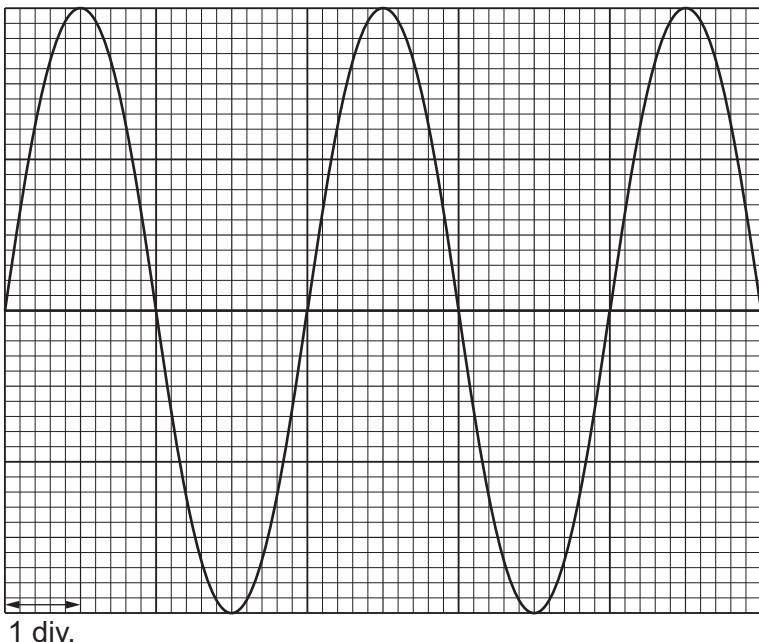


Fig. 5.1

The time-base on the CRO is set to 1.0 ms div^{-1} .

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- (i) Calculate the frequency of the sound waves detected by the microphone.

frequency = Hz [2]

- (ii) Determine the speed of the sound in air.

speed of sound = ms^{-1} [2]

[Total: 6]