

- 4 (a) State what is meant by the *frequency* of a progressive wave.

.....
.....
.....

[2]

- (b) A cathode-ray oscilloscope (c.r.o.) is used to determine the frequency of the sound emitted by a loudspeaker. The trace produced on the screen of the c.r.o. is shown in Fig. 4.1.

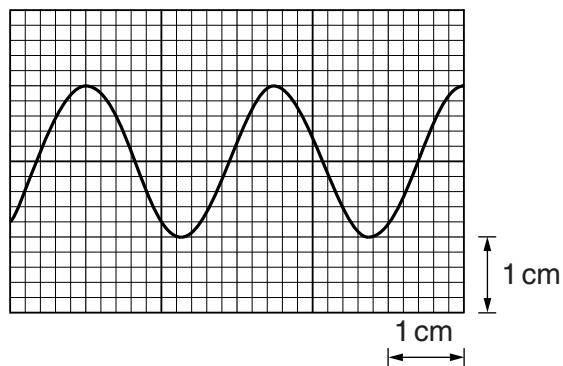


Fig. 4.1

The time-base setting of the c.r.o. is $250 \mu\text{s cm}^{-1}$.

Show that the frequency of the sound wave is 1600 Hz.

[2]

- (c) The loudspeaker in (b) emits the sound in all directions. A person attaches the loudspeaker to a string and then swings the loudspeaker at a constant speed in a horizontal circle above his head.

An observer, standing a large distance away from the loudspeaker, hears sound of maximum frequency 1640 Hz. The speed of sound in air is 330 m s^{-1} .

- (i) Determine the speed of the loudspeaker.

$$\text{speed} = \dots \text{ ms}^{-1} [2]$$

- (ii) Describe and explain, qualitatively, the variation in the frequency of the sound heard by the observer.

.....

.....

.....

.....

.....

[2]

[Total: 8]