

- 4 (a) By reference to the direction of transfer of energy, state what is meant by a *longitudinal* wave.

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

- (b) A vehicle travels at constant speed around a wide circular track. It continuously sounds its horn, which emits a single note of frequency 1.2 kHz. An observer is a large distance away from the track, as shown in the view from above in Fig. 4.1.

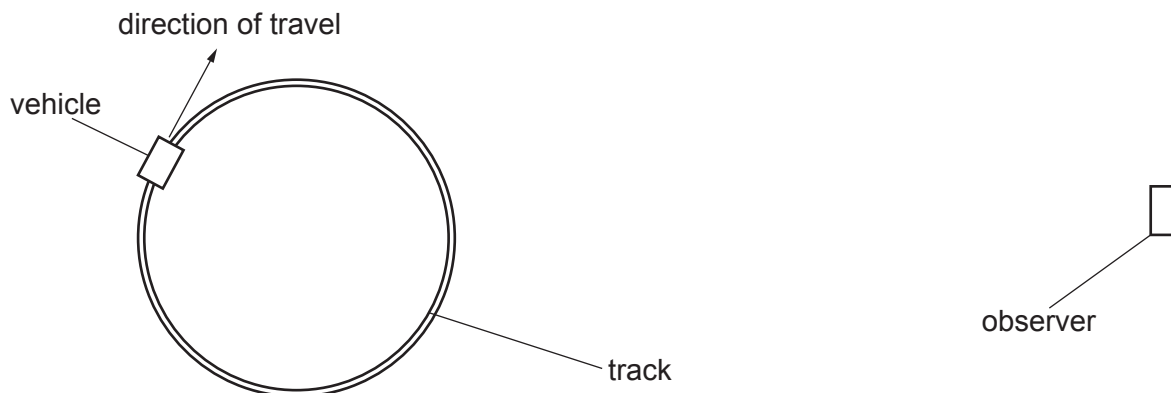


Fig. 4.1 (not to scale)

Fig. 4.2 shows the variation with time of the frequency f of the sound of the horn that is detected by the observer. The time taken for the vehicle to travel once around the track is T .

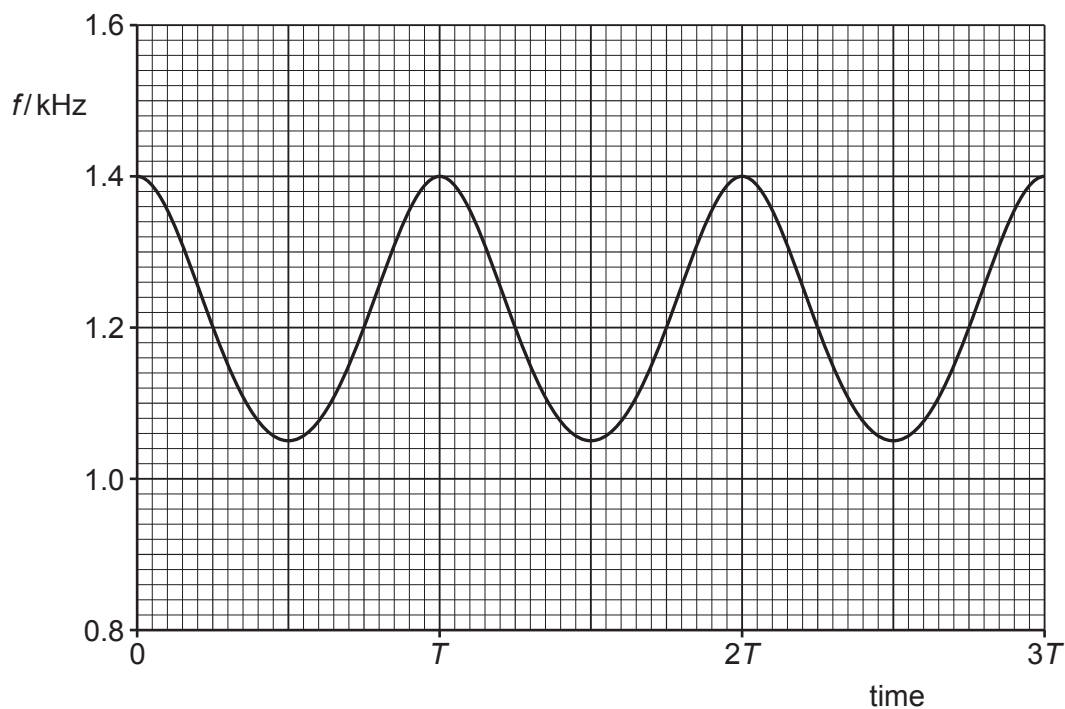


Fig. 4.2

- (i) Explain why the frequency of the sound detected by the observer is sometimes above and sometimes below 1.2 kHz.

.....

 [2]

- (ii) State the name of the phenomenon in (b)(i).

..... [1]

- (iii) On Fig. 4.1, mark with a letter X the position of the vehicle when it emitted the sound that is detected at time T . [1]

- (iv) On Fig. 4.1, mark with a letter Y the position of the vehicle when it emitted the sound that is detected at time $\frac{9T}{4}$. [1]

- (c) The speed of the sound in the air is 320 m s^{-1} .

Use Fig. 4.2 to determine the speed of the vehicle in (b).

speed = m s^{-1} [3]