

- 5 A train travels at a constant high speed along a straight horizontal track towards an observer standing adjacent to the track, as shown in Fig. 5.1.

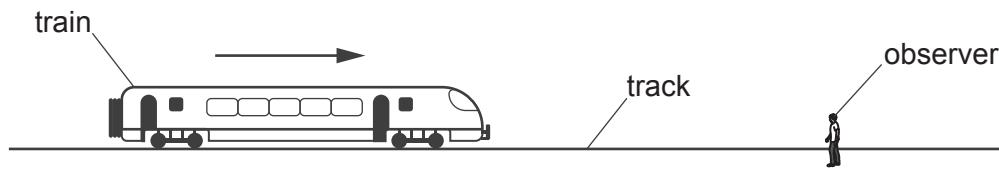


Fig. 5.1

The train sounds its horn continuously as it approaches the observer, from time  $t = 0$  until it is well past the observer at time  $t = t_2$ . The train passes the observer at time  $t = t_1$ .  
The horn emits a sound wave of constant frequency  $f_s$ .

- (a) On Fig. 5.2, sketch the variation of the frequency of sound heard by the observer with time  $t$ , from time  $t = 0$  to  $t = t_2$ .

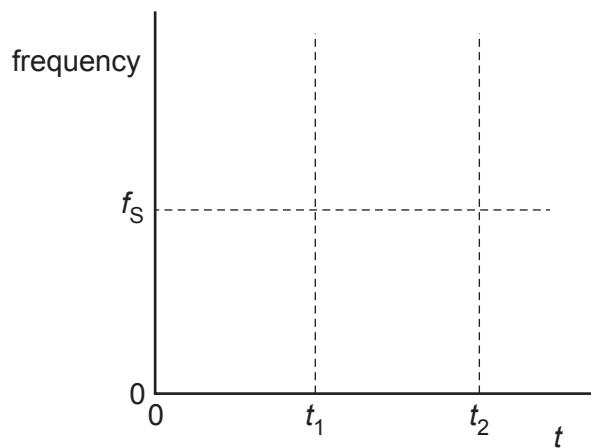


Fig. 5.2

[1]

- (b) At a particular time, the sound waves at the observer have an intensity of  $4.7 \times 10^{-3} \text{ W m}^{-2}$ . The waves at the observer are incident at right angles on a circular detector of radius 2.8 cm.

Calculate the power  $P$  of the waves incident on the detector.

$$P = \dots \text{W} [3]$$