6 A train travels at constant speed along a straight horizontal track towards an observer standing adjacent to the track, as shown in Fig. 6.1.
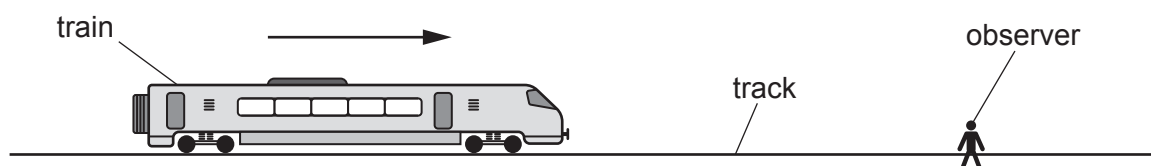

Fig. 6.1

The train sounds its horn continuously as it approaches the observer. The horn emits a sound of constant frequency 251 Hz. The frequency of sound heard by the observer is 291 Hz. The speed of sound in air is 340 m s^{-1}.

(a) Calculate the speed of the train.

speed = ... m s^{-1} [2]

(b) The train approaches and then passes the observer. The intensity I of the sound heard by the observer varies with the distance d of the horn from the observer.

When the horn is at a distance x_0 from the observer, the intensity I of the sound heard is I_0 and the amplitude A of the sound wave at the observer is A_0.

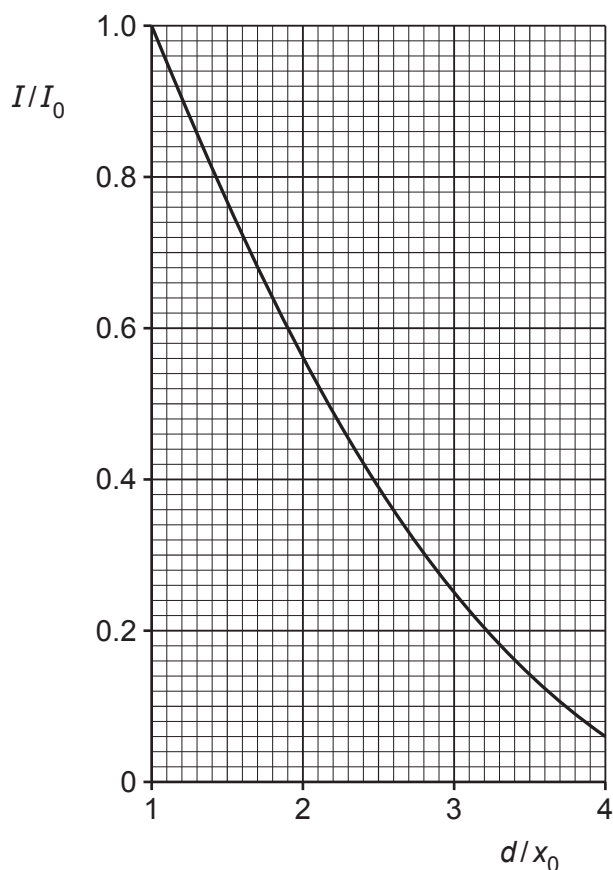Fig. 6.2 shows the variation with d/x_0 of I/I_0 as the train moves away from the observer.

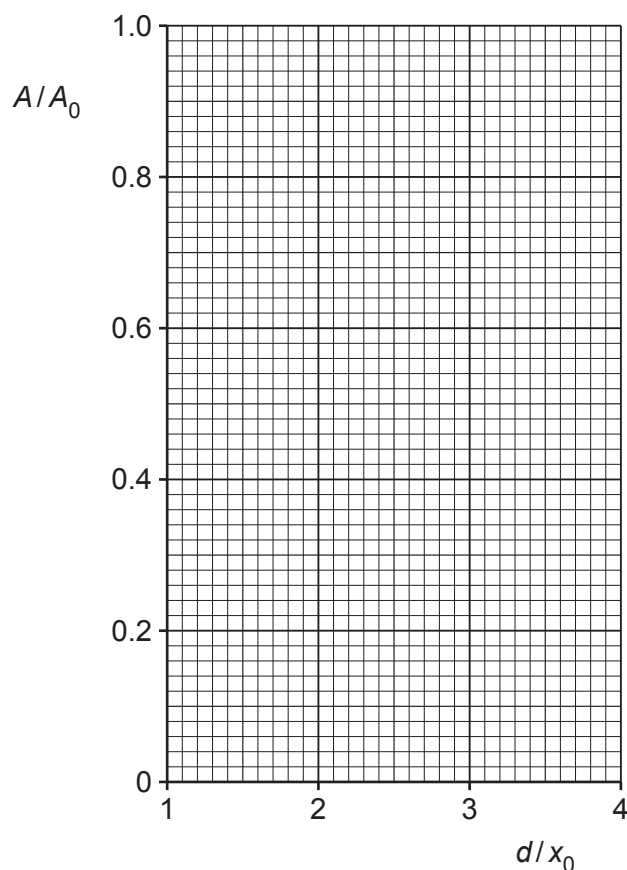

Fig. 6.2	**Fig. 6.3**

(i) State the relationship between amplitude A and intensity I for a progressive wave.

.... [1]

(ii) On Fig. 6.3, sketch the variation with d/x_0 of A/A_0. [2]

[Total: 5]