**5** **(a)** A stationary wave is formed on a string XY that has a length of 0.48 m. Fig. 5.1 shows the string at one instant in time.

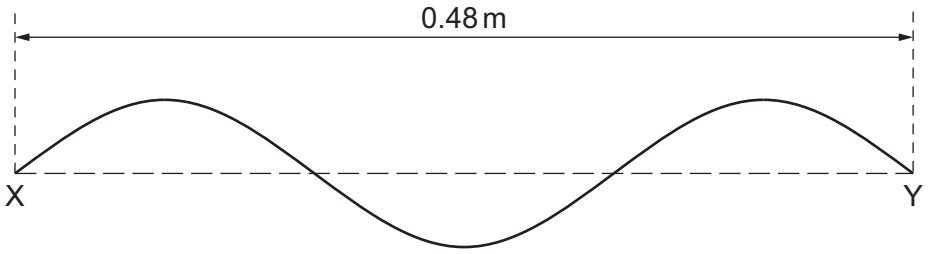


**Fig. 5.1**

The speed of the wave on the string is 1400 m s$^{-1}$.

**(i)** On Fig. 5.1, draw a cross (×) at **one** position that is a node and another cross at **one** position that is an antinode. Label the node N and the antinode A. [1]

**(ii)** Show that the wavelength of the wave produced is 0.32 m. Explain your reasoning.

[1]

**(iii)** Calculate the frequency of the wave.

frequency = ..... Hz [2]

**(b)** A source of sound waves of frequency 780 Hz is on a rotating platform. The speed of the source is 39 m s$^{-1}$.

The sound is detected by an observer that is a large distance from the rotating platform, as shown in Fig. 5.2.

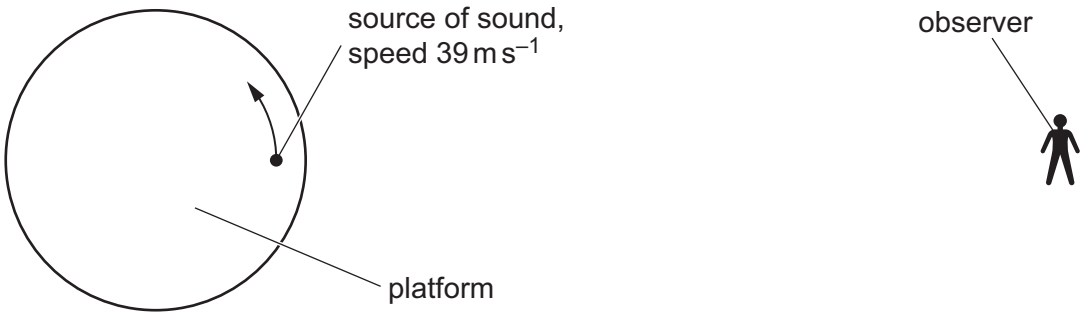


**Fig. 5.2** (not to scale)

**(i)** The speed of sound in air is 320 m s$^{-1}$.

Calculate the maximum frequency of the sound detected by the observer.

maximum frequency = ..... Hz [2]

**(ii)** At time $t$ = 0, the observer detects the sound emitted by the source when it was in the position shown in Fig. 5.2.

On Fig. 5.3, sketch the variation with $t$ of the frequency $f$ of the sound detected by the observer for one complete rotation of the platform. Calculations are not required.

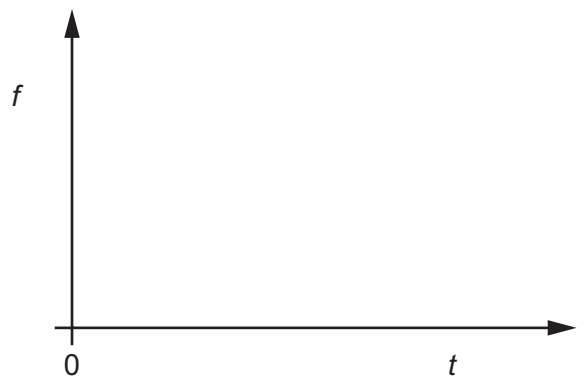


**Fig. 5.3**

[2]

[Total: 8]