**4** **(a)** State the conditions required for the formation of stationary waves.

.....

.....

.....[2]

**(b)** One end of a string is attached to a vibrator. The string is stretched by passing the other end over a pulley and attaching a load, as illustrated in Fig. 4.1.

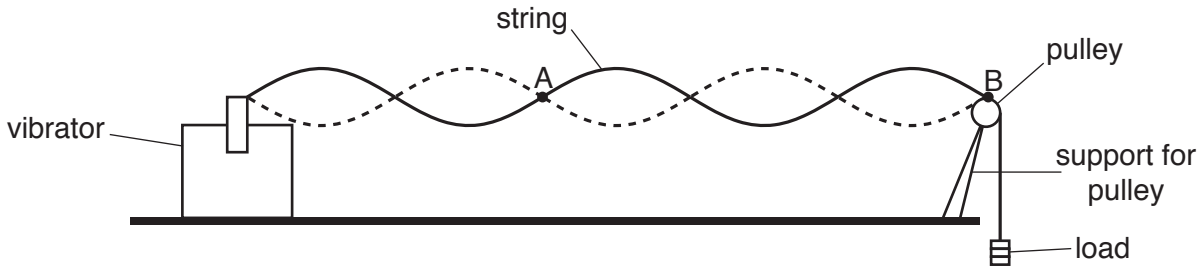


**Fig. 4.1**

The frequency of vibration of the vibrator is adjusted to 250 Hz and a transverse wave travels along the string with a speed of 12 m s$^{-1}$. The wave is reflected at the pulley and a stationary wave forms on the string.

Fig. 4.2 shows the string between points A and B at time $t = t_1$.

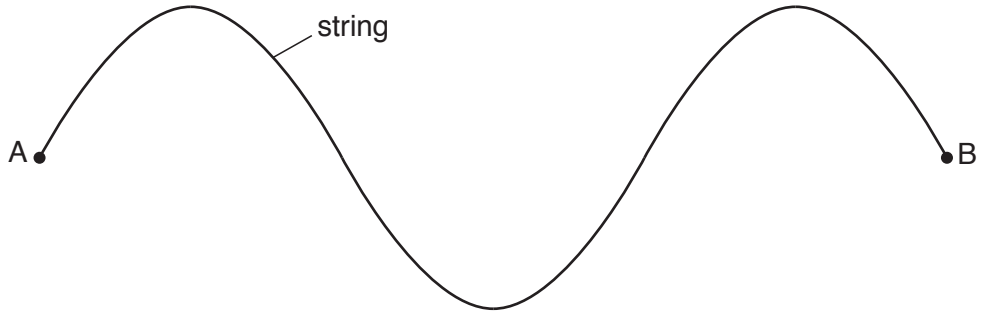


**Fig. 4.2**

At time $t = t_1$ the string has maximum displacement.

**(i)** Calculate the distance AB.

distance = .....m [2]

**(ii)** On Fig. 4.2, sketch the position of the string between A and B at times

**1.** $t = t_1 + 2.0\,\text{ms}$ (label this line P),

**2.** $t = t_1 + 5.0\,\text{ms}$ (label this line Q).

[3]

[Total: 7]