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.
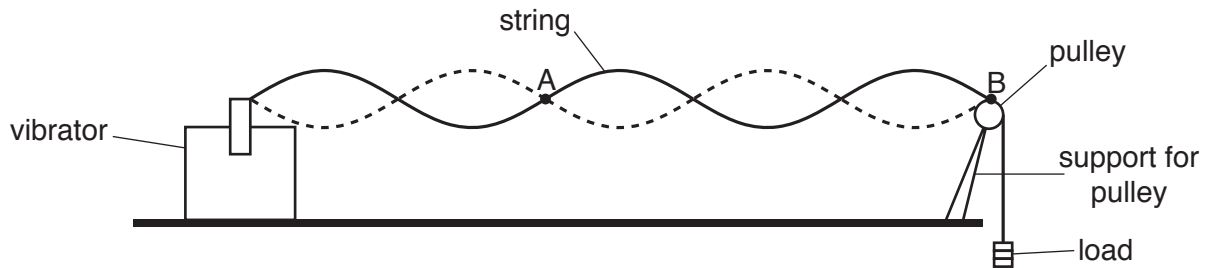

Fig. 4.1

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.

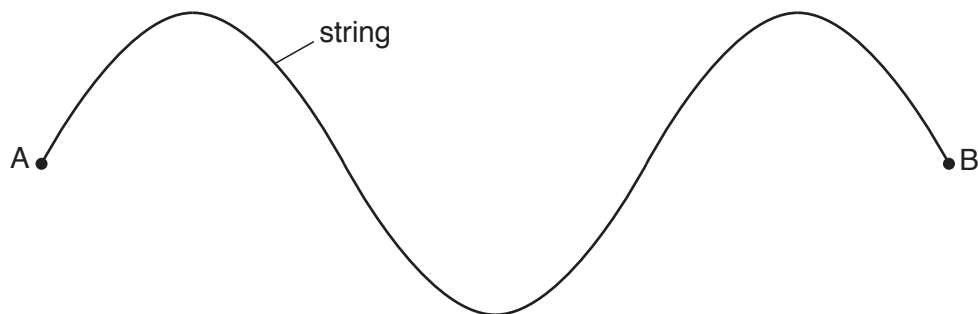Fig. 4.2 shows the string between points A and B at time $t = t_1$.

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]

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