5 **(a)** State what is meant by

(i) the *frequency* of a progressive wave,

.....

.....

.....[2]

(ii) the *speed* of a progressive wave.

.....

.....[1]

(b) One end of a long string is attached to an oscillator. The string passes over a frictionless pulley and is kept taut by means of a weight, as shown in Fig. 5.1.

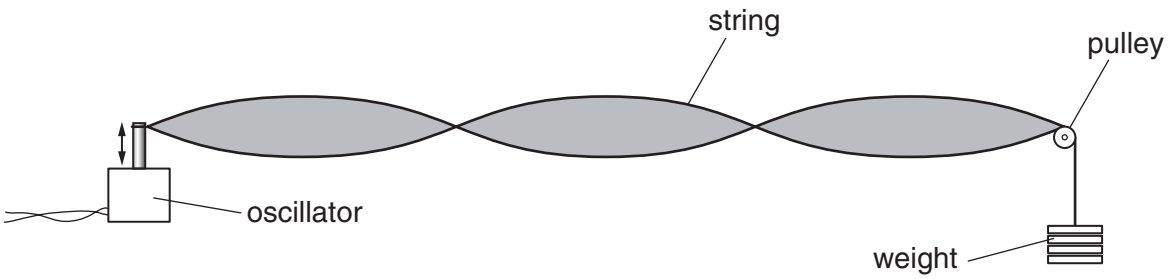

Fig. 5.1

The frequency of oscillation is varied and, at one value of frequency, the wave formed on the string is as shown in Fig. 5.1.

(i) Explain why the wave is said to be a *stationary wave*.

.....

.....[1]

(ii) State what is meant by an *antinode*.

.....

.....[1]

(iii) On Fig. 5.1, label the antinodes with the letter A. [1]

(c) A weight of 4.00 N is hung from the string in **(b)** and the frequency of oscillation is adjusted until a stationary wave is formed on the string. The separation of the antinodes on the string is 17.8 cm for a frequency of 125 Hz.

For Examiner's Use

The speed v of waves on a string is given by the expression

$$v = \sqrt{\frac{T}{m}} \ ,$$

where T is the tension in the string and m is its mass per unit length.

Determine the mass per unit length of the string.

mass per unit length = ... $kg\,m^{-1}$ [5]