5 **(a)** Two progressive sound waves meet to form a stationary wave. The two waves have the same amplitude, wavelength, frequency and speed.

State the other condition that must be fulfilled by the two waves in order for them to produce the stationary wave.

..... [1]

(b) A stationary wave is formed on a string that is stretched between two fixed points A and B. Fig. 5.1 shows the string at time $t = 0$ when each point is at its maximum displacement.

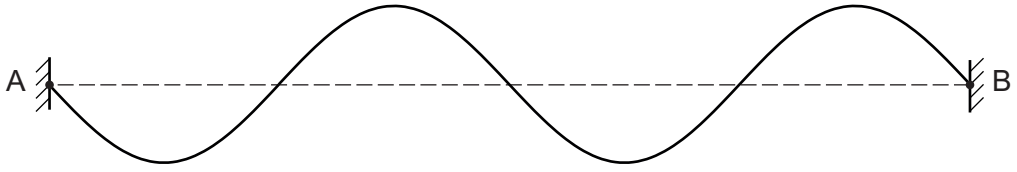

Fig. 5.1

Distance AB is 0.80 m. The period of the stationary wave is 0.016 s.

(i) On Fig. 5.1, sketch a solid line to show the position of the string:

- at time $t = 0.004$ s (label this line P)
- at time $t = 0.024$ s (label this line Q).

[2]

(ii) Determine the speed of a progressive wave along the string.

speed = ... $m\,s^{-1}$ [3]

(c) A beam of vertically polarised light of intensity I_0 is incident normally on a polarising filter that has its transmission axis at 30° to the vertical, as shown in Fig. 5.2.

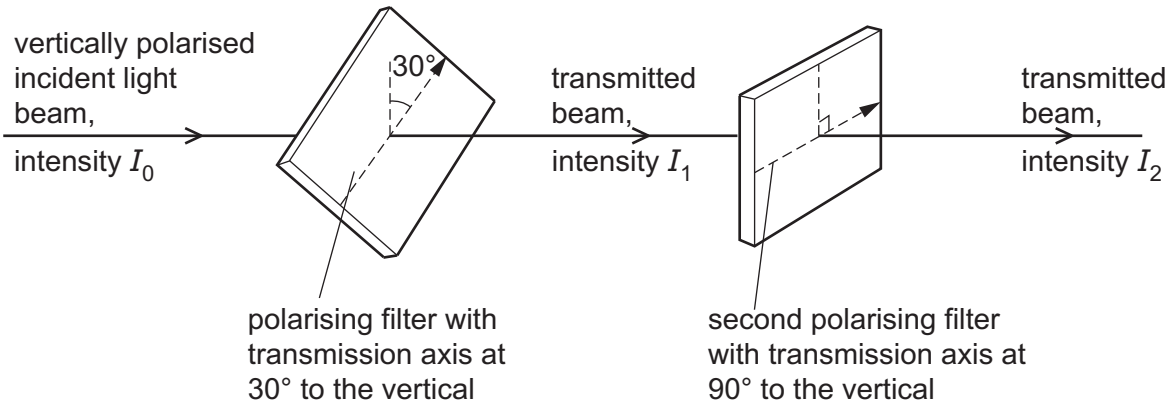

Fig. 5.2

The transmitted light from the first polarising filter has intensity I_1. This light is then incident normally on a second polarising filter that has its transmission axis at 90° to the vertical. The transmitted light from the second filter has intensity I_2.

Calculate:

(i) the ratio $\frac{I_1}{I_0}$

$\frac{I_1}{I_0}$ = ... [2]

(ii) the ratio $\frac{I_2}{I_0}$.

$\frac{I_2}{I_0}$ = ... [2]

[Total: 10]