6 **(a)** Explain what is meant by a progressive transverse wave.

progressive …………………………………………………………………………………………..

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………………………………………………………………………………………………………..

transverse ..…………………………………………………………………………………………..

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………………………………………………………………………………………………………...........[2]

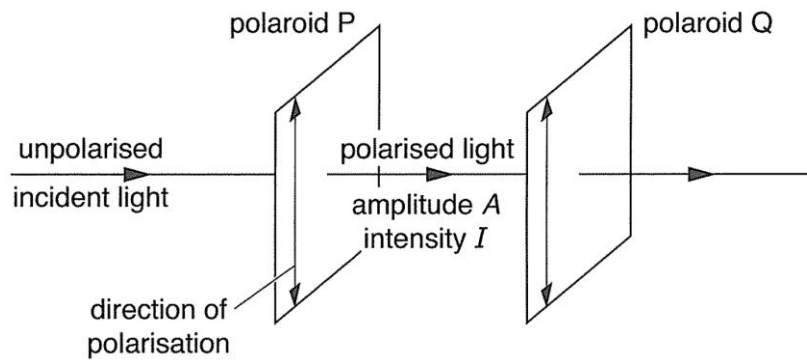**(b)** A wave of frequency f and wavelength λ has speed v.

Using the definition of speed, deduce the equation $v = f\lambda$.

[2]

**(c)** Light is polarised when it passes through a sheet of material known as polaroid.

Two sheets of polaroid P and Q are placed close to one another, with their planes parallel, as shown in Fig. 6.1.

Fig. 6.1

A parallel beam of light passes through polaroid P. The beam, after passing through polaroid P, has amplitude A and intensity I.

(i) The polaroid Q is now rotated about the axis of the light beam, as shown in Fig. 6.2.
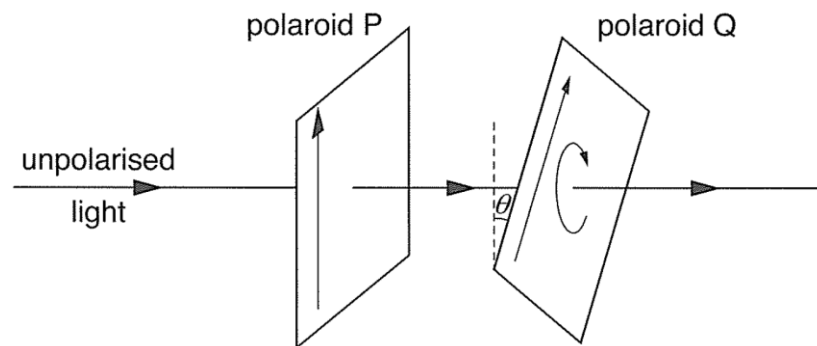
Fig. 6.2

The plane of polaroid Q remains parallel to the plane of polaroid P.

The angle between the direction of polarisation of polaroid P and of polaroid Q is θ.

Complete Table 6.1 to show the amplitude, in terms of A, and the intensity, in terms of I, of the light transmitted through polaroid Q for angle θ equal to 180°, 90° and 60°.
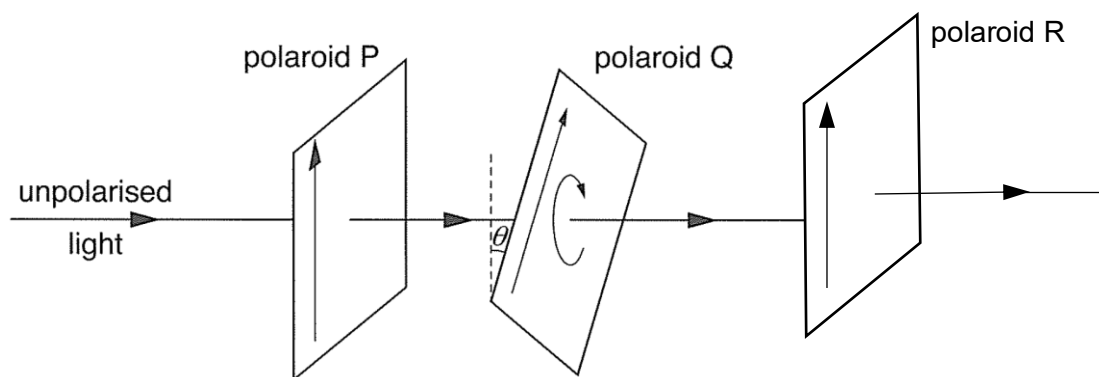
Table 6.1

angle θ	amplitude	intensity
180°	A	I
90°	0	0
60°	$0.5A$	$0.25I$

[3]

(ii) Another polaroid R is placed close to polaroid P and Q, with their planes parallel, as shown in Fig. 6.3.

The polaroid Q is rotated about the axis of the light beam, as shown in Fig. 6.3.

Fig. 6.3

The plane of polaroid Q remains parallel to the plane of polaroid P and R.

The angle between the direction of polarisation of polaroid P and of polaroid Q is θ.

Complete Table 6.2 to show all values of angle θ for the intensity of the light transmitted through polaroid R, that is equal to zero, maximum and $\dfrac{I}{2}$ respectively, as polaroid Q is rotated from 0° to 180°.

Table 6.2

intensity	$\theta\,/°$
zero	
maximum	
$\dfrac{I}{2}$	

[2]

[Total: 9]

Question 7 starts on the next page.