4 **(a)** State why light waves can be polarised, but sound waves cannot.

.....

..... [1]

(b) Plane polarised light of intensity I_0 is incident normally on a polarising filter P. The transmitted light also has intensity I_0, as shown in Fig. 4.1.

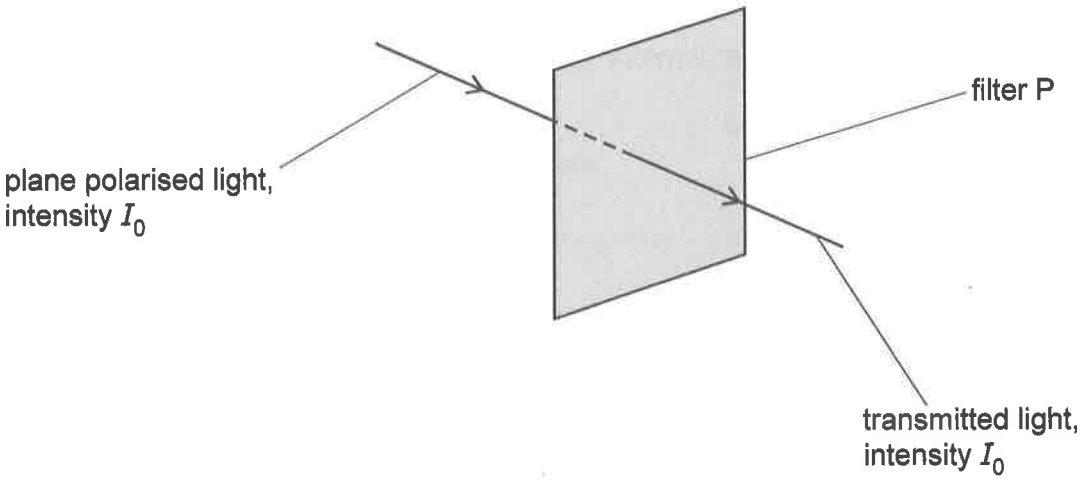

Fig. 4.1

Filter P is rotated about an axis parallel to the ray of light until no light is transmitted by the filter.

(i) State the angle through which filter P is rotated.

angle = ...° [1]

(ii) Polarising filter Q is now introduced into the path of the light **just in front of** the rotated filter P, as shown in Fig. 4.2.

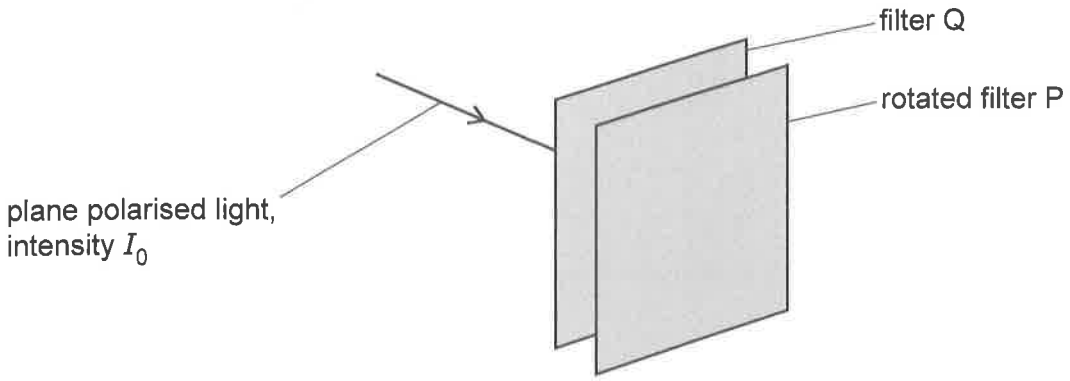

Fig. 4.2

The polarising direction of filter Q is initially the same as that of filter P in Fig. 4.1.

Filter Q is then rotated through 180° about an axis parallel to the ray of light.

On Fig. 4.3, sketch the variation of the intensity of the light transmitted by filter P with the angle rotated by filter Q as the angle increases from 0 to 180°.

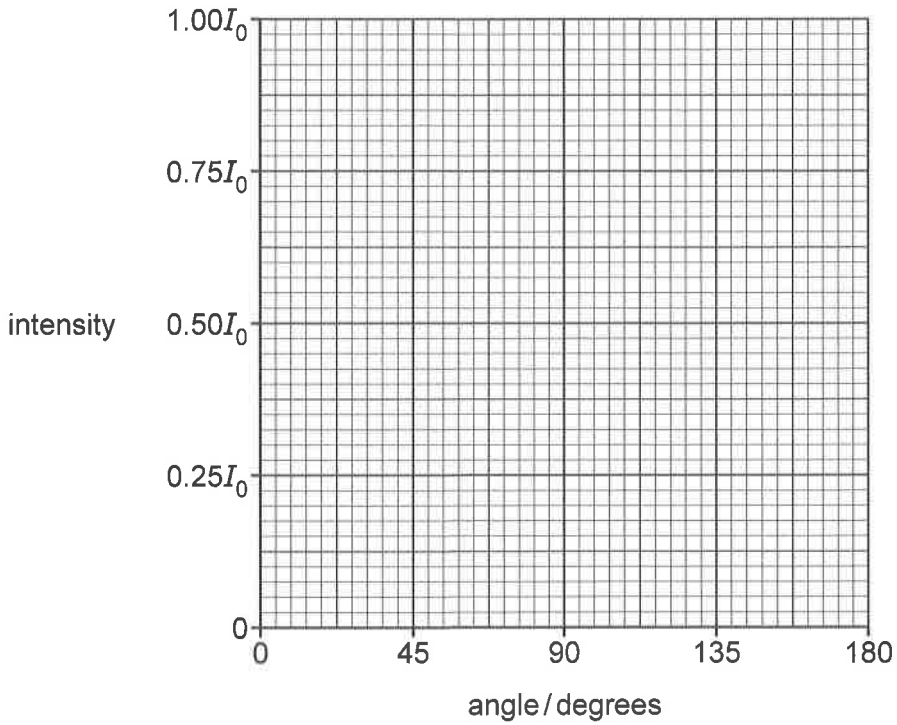

Fig. 4.3

[3]

(c) The light in **(b)(ii)** is emitted by a point source which is at a distance of 50 m from filter Q.

(i) Calculate, in terms of I_0, the intensity of the light at a distance of 10 m from the source.

intensity = ... I_0 [2]

(ii) The amplitude of the light at a distance of 10 m from the source is A.

Calculate, in terms of A, the amplitude of the light incident on filter Q.

amplitude = ... A [2]

[Total: 9]