4 **(a)** Polarisation is a phenomenon associated with light waves but not with sound waves.

(i) State the meaning of polarisation.

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..... [1]

(ii) State why light waves can be plane polarised but sound waves cannot.

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..... [1]

(b) Two polarising filters A and B are positioned so that their planes are parallel to each other and perpendicular to a central axis line XY, as shown in Fig. 4.1.

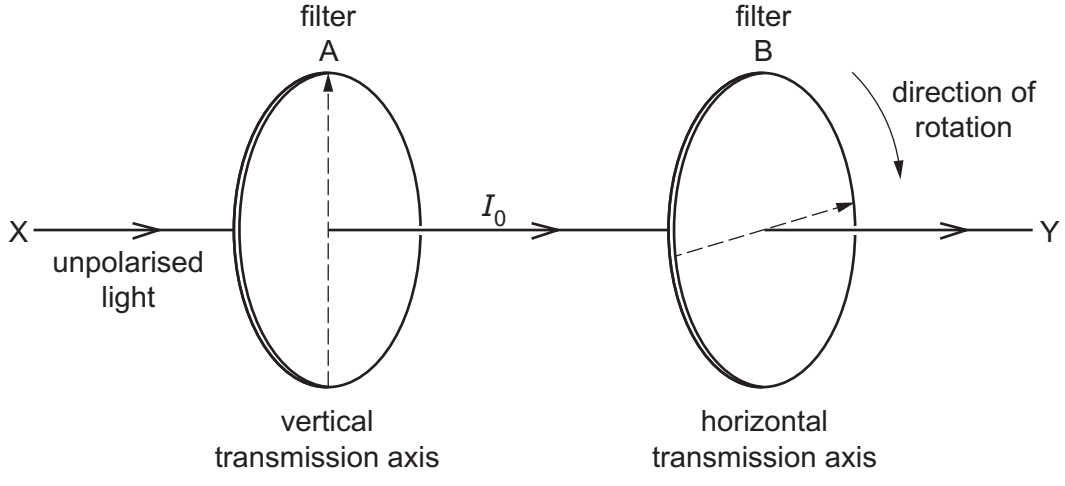

Fig. 4.1

The transmission axis of filter A is vertical and the transmission axis of filter B is horizontal.

Unpolarised light of a single frequency is directed along the line XY from a source positioned at X. The light emerging from filter A is vertically plane polarised and has intensity I_0.

Filter B is rotated from its starting position about the line XY, as shown in Fig. 4.1.

After rotation, the intensity of the light emerging from filter B is $\frac{1}{4} I_0$.

Calculate the angle of rotation of filter B from its starting position.

angle of rotation = ... ° [3]

(c) A microwave of intensity I_0 and amplitude A_0 meets another microwave of the same frequency and of intensity $\frac{1}{4} I_0$ travelling in the opposite direction. Both microwaves are vertically plane polarised and superpose where they meet.

(i) Explain, without calculation, why these two waves cannot form a stationary wave with zero amplitude at its nodes.

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..... [2]

(ii) Determine, in terms of A_0, the maximum amplitude of the wave formed.

maximum amplitude = ... A_0 [3]

[Total: 10]