

- 3 (a)(i)** By reference to the direction of propagation of energy, state how plane-polarised light differs from unpolarised light.

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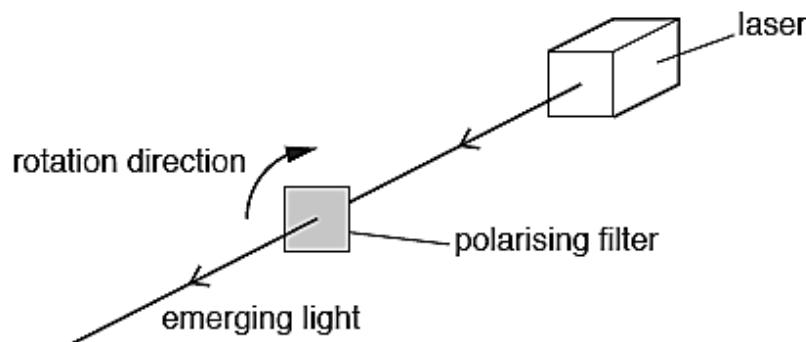
[2]

- (ii)** Explain why sound waves cannot be polarised.

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[1]

- (b)** Light from a laser incident normally on an ideal polarising filter. The polarising filter is slowly rotated about a horizontal axis that is parallel to the incident light as shown in Fig. 3.1.



**Fig. 3.1**

It was observed that the intensity of the emerging light varies from  $I_0$  to 0.

- (i)** State what may be deduced from this observation.

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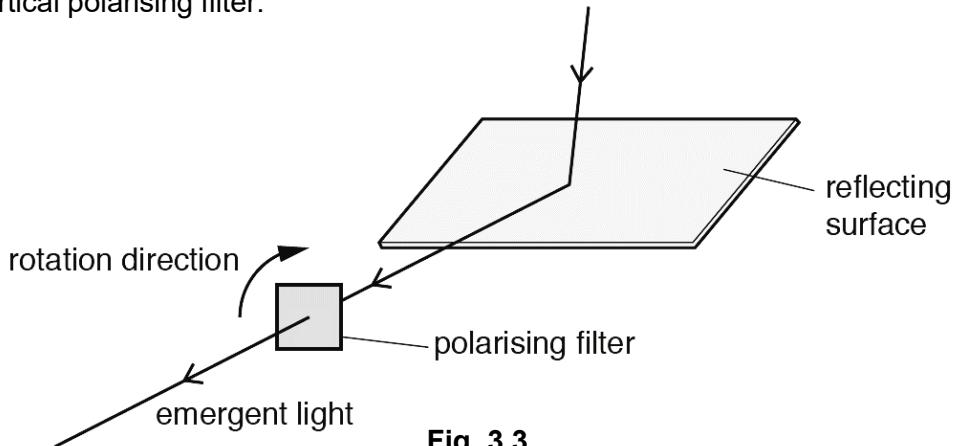
[1]

- (ii)** On Fig. 3.2, sketch a graph to show how the intensity of the emerging light may vary with the angle  $\theta$  which the filter is rotated. [2]



**Fig. 3.2**

- (c) Fig. 3.3 shows a beam of sunlight that is reflected from a surface and passes through a vertical polarising filter.



**Fig. 3.3**

The light that reflects from the surface is an unequal mixture of vertically polarised and horizontally polarised light.

When the polarising direction of the filter is vertical, the intensity of the emergent light is  $0.262 I_0$ . When the polarising direction of the filter is horizontal, the intensity is  $0.850 I_0$ .

Determine the intensity of the emergent light when the polarising direction of the filter is  $30^\circ$  from the vertical.

$$\text{intensity} = \dots I_0 [2]$$

[Total: 8]