4 **(a)** **(i)** State what is meant by *plane polarisation* of waves.

……..…….....

……..…….... [1]

(ii) State why a sound wave cannot be polarised

……..…….....

……..…….... [1]

(b) A beam of unpolarised light is shone through two polarising filters X and Y, as shown in Fig. 4.1.

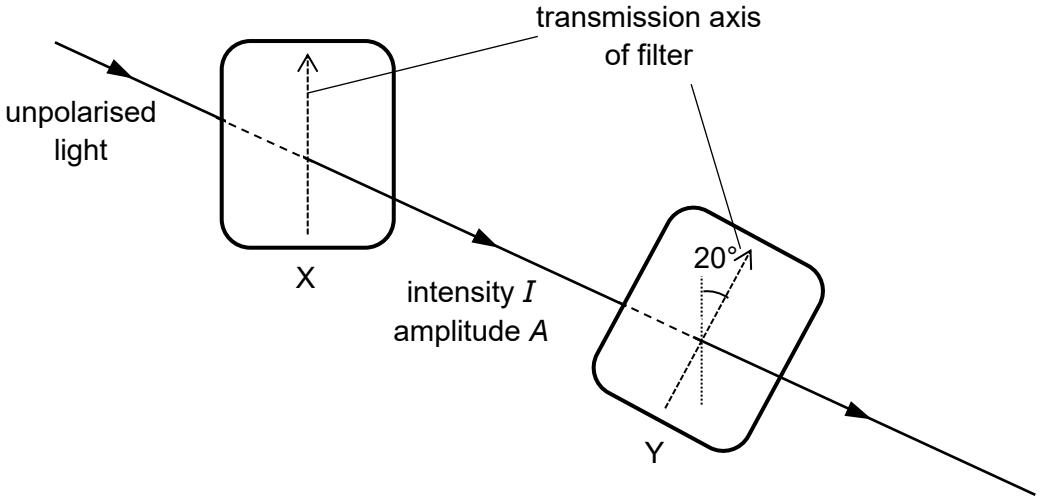

Fig. 4.1

The intensity and amplitude of the light after passing through polarising filter X is I and A respectively.

Polarising filter Y is positioned with its transmission axis at an angle of 20° to that of polarising filter X.

(i) For the unpolarised light before passing through polarising filter X, state

1. its amplitude, in terms of A.

amplitude = ……. [1]

2. its intensity, in terms of I,

intensity = ……. [1]

(ii) Calculate the intensity of light, in terms of I, after passing through polarising filter Y.

intensity = ……. [2]

(iii) Polarising filter Y is now rotated about the direction of the light beam, from its starting position shown in Fig. 4.1. The direction of rotation is such that the angle of the transmission axis to the vertical initially increases as shown in Fig. 4.2.

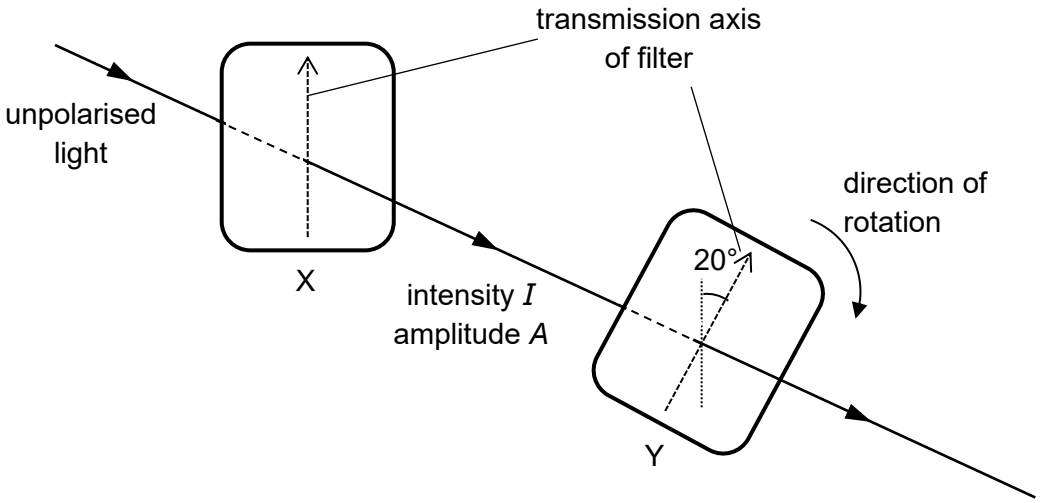

Fig. 4.2

Calculate the minimum angle through which filter Y must be rotated by so that the intensity of the light after passing through polarising filter Y returns to the value that it had when the filter was at its starting position.

angle = ……. ° [1]