

- 4 (a) State how a *polarised* transverse wave differs from an *unpolarised* transverse wave.

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.....  
.....

[1]

- (b) Light is polarised when it passes through a sheet material known as a polaroid. Three polaroids are stacked, with the polarising axis of the second and third polaroids at  $\theta$  and  $62^\circ$  respectively, to that of the first, as shown in Fig. 4.1.

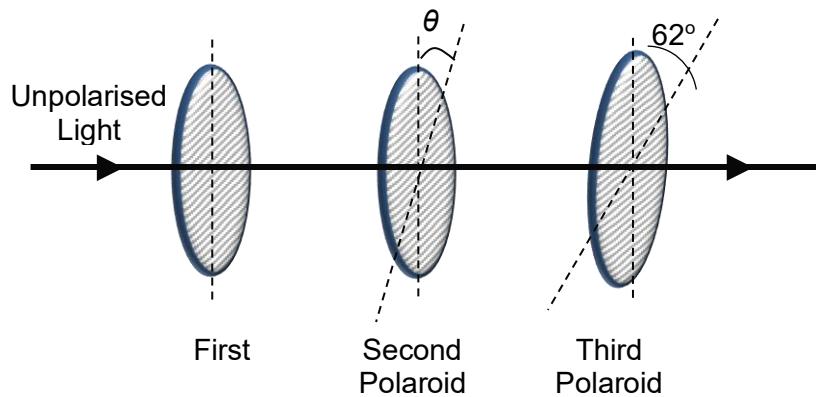


Fig. 4.1

When an unpolarised light of amplitude  $A_0$  is incident on the stack of polaroids, the light has amplitude of  $A_1$  after it passes through the first polaroid,  $A_2$  after it passes through the second polaroid and  $A_3$  after it passes through the third polaroid.

- (i) If  $\theta = 90^\circ$ , determine  $A_3$  in terms of  $A_1$ .

$$A_3 = \dots [1]$$

(ii) If the second polaroid is rotated such that  $\theta = 23^\circ$

1. Show that  $A_3 = 0.715 A_1$ .

[2]

2. The intensity of the unpolarised light after it passes through the first polaroid is reduced to half.

Determine the percentage reduction of the intensity after the unpolarised light passes through the stack of three polaroids.

percentage reduction = ..... % [3]

[Total: 7]



