3 (a) Explain what is meant by a *polarised light*.

……

……

……[1]

(b) A beam of polarised light of intensity I_0 incident on polariser A as shown in Fig. 3.1.

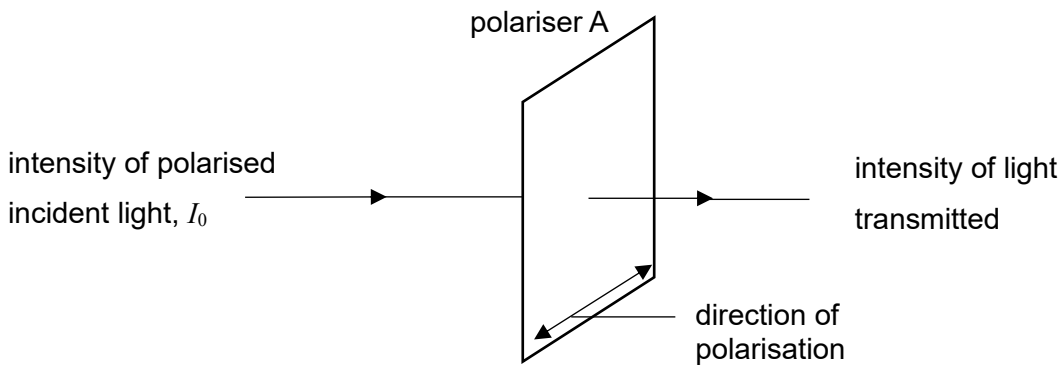

Fig. 3.1

Polariser A is arranged such that the intensity of light transmitted through it is ***zero***.

(i) With reference to the arrangement in Fig. 3.1, by placing another polariser X before polariser A with both planes in parallel, the intensity of light transmitted may now be greater than zero. Explain why this is so.

……

……

……

……

…… [2]

(ii) Initially, the directions of polarisation of polariser X and A are parallel.
Polariser X is then rotated about the axis of the light beam while keeping the planes of the polarisers parallel.

The angle between the direction of polarisation of polariser X and of polariser A is θ.

1. Complete the table below. You may use the space below for your working. [2]

θ	**Intensity of light transmitted through polariser A (in terms of I_o)**
0°	0
45°	
60°	

2. Polariser X is rotated through 360° about the axis of the light beam.
Sketch on the axes of Fig. 3.2 the variation with the angle of rotation θ of the intensity I of the light after passing through polariser A. [2]

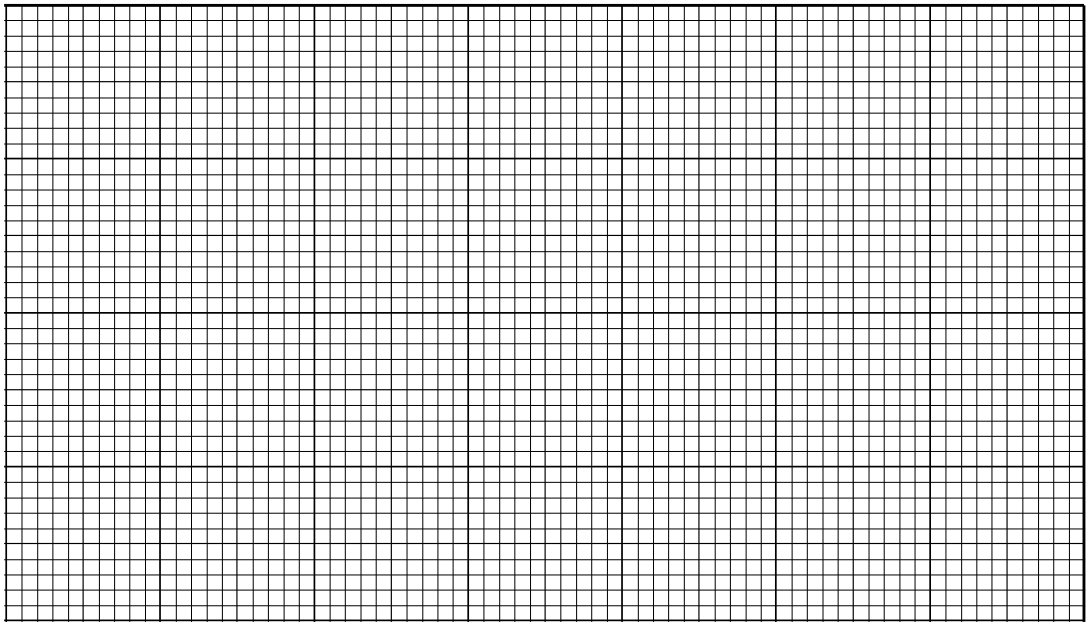

Fig. 3.2

(c) A speaker of a public address system radiates sound uniformly in all directions.
The intensity of the sound wave detected by a microphone located 78.0 m away from the speaker is 0.026 Wm^{-2}.

(i) Determine the detected intensity if the same microphone is moved to a position 300.0 m away from the speaker.

intensity = ... $W\ m^{-2}$ [2]

(ii) Find the power received at the position 300.0 m by the microphone diaphragm which has an area of 3.20 cm^2.

power = …… W [1]