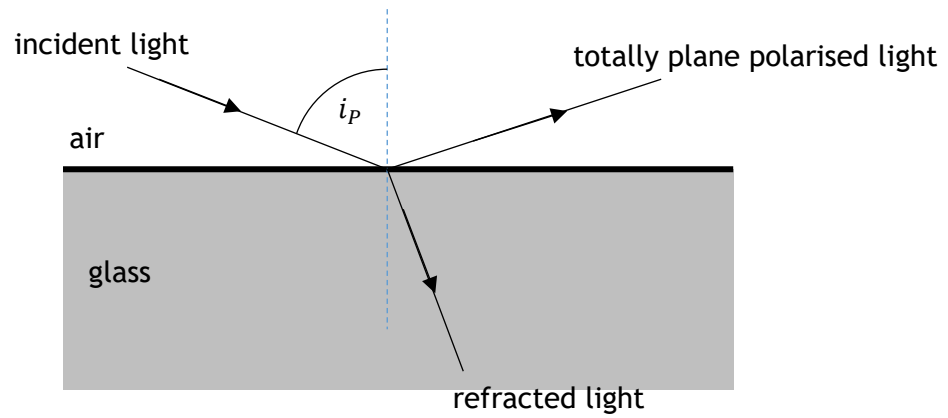# Homework – Polarisation

1. Light can be polarised by reflection from a sheet of glass.

   For a particular angle of incidence i_P, the reflected ray is totally plane polarised. This situation is represented in the diagram below.

   Show that

   $$n = tan\, i_P$$

   where n is the refractive index of the glass.

2. Light can be polarised using an appropriate filter.

   (a) State the difference between polarised and unpolarised light.

   (b) The diagram below shows two polarising filters.

   The first filter is called the polariser and the second the analyser.

   The direction of the transmission axis is shown for each filter.

transmission axis

unpolarised
light source

polariser   analyser
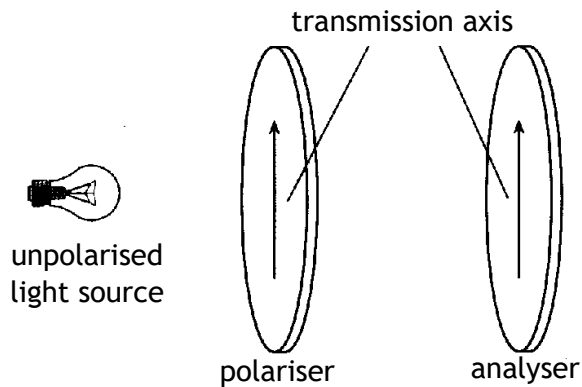
   Unpolarised light is passed through the two filters.

   The transmission axis of the analyser is now turned to different positions as shown in the table.

Analyser setting	Position of analyser's transmission axis	Intensity of transmitted light (Wm^{-2})
A	↑	5·0
B	↗	
C	→	
D	↘	
E	↓	

   State possible values of intensity for the transmitted light when the analyser is in the positions B, C, D and E.

Homework – Polarisation

3. A pupil is investigating the polarisation of waves.

    The pupil wishes to investigate the polarisation of sound waves and asks the teacher for suitable apparatus. The teacher says that sound waves cannot be polarised.

    (a) State why sound waves cannot be polarised.

    (b) The pupil discovers, during background reading, that Brewster's angle i_P for the liquid solvent trimethylamine is given as 54·5°.

   State the meaning of Brewster's angle.
     You must create a labelled diagram showing Brewster's angle.

   (c) Calculate the refractive index of trimethylamine.

Homework – Polarisation

4. A pupil wearing polarising sunglasses, is using a tablet computer outdoors. The orientation of the tablet seems to affect the image observed by the pupil.

   Two orientations are shown in the diagram below.

   landscape mode   portrait mode
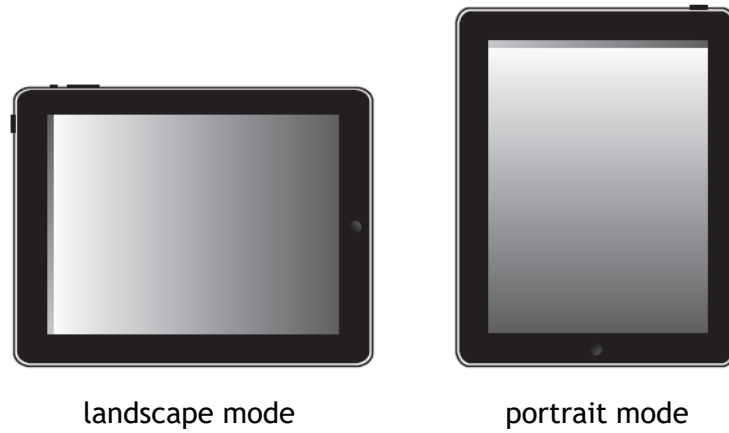
   (a) In landscape mode the image appears bright and in portrait mode it appears dark.

      (i)   State what this indicates about the light emitted from the tablet screen.

      (ii)   The pupil slowly rotates the tablet.
              Describe the change in brightness observed by the pupil as it is rotated through 180°.

   (b) Unpolarised sunlight is incident on a water surface as shown in the diagram below.

   incident   plane polarised
   sunlight   light

   θ

   water
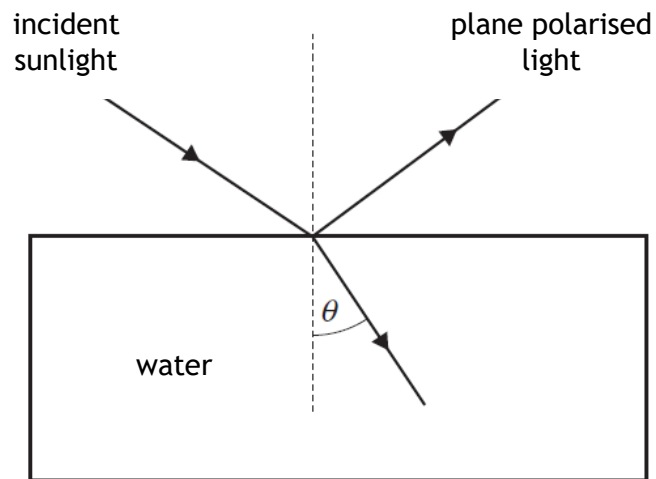
   The light is 100% plane polarised on reflection.

   Calculate the angle of refraction θ.