series the single the principle selection of the Nicols being 0. Find the relative error in the intensity due to an error $\Delta\theta$ in the setting of the second Nicol →

Ans! Nicol prism ⇒

It is an optical device used or it is an optical made from a calcite for producing and analysing plan polarised light. It was invented by willian Nicol in 1828 who was an expert in cutting and polishing gems and

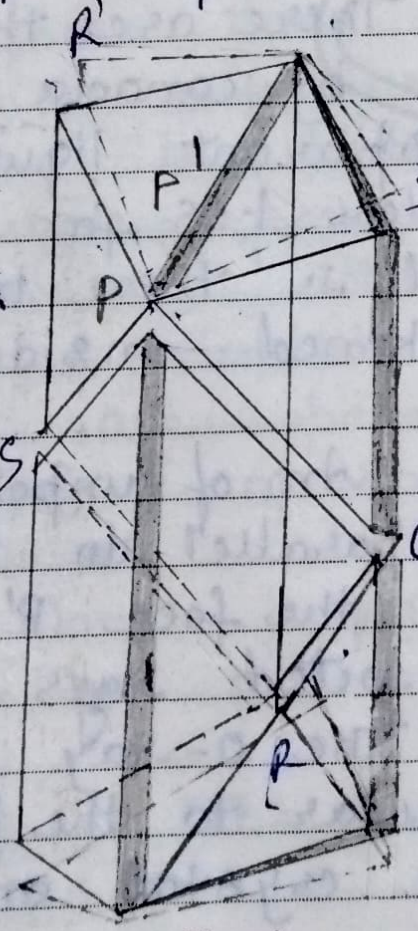
Sunday
May 12 132nd Day

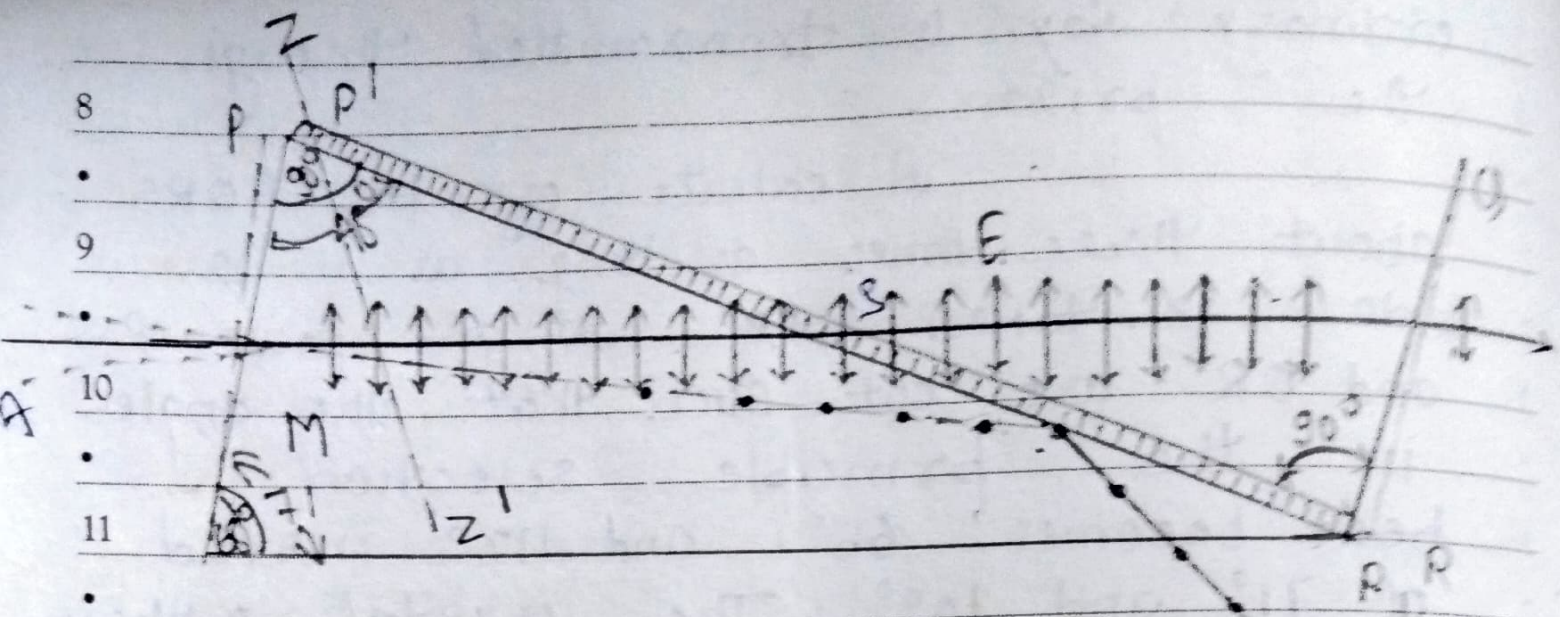
crystals.

construction ⇒ The Nicol prism is made in such a way that it eliminates one of the two rays by total internal reflection. It is generally found that the ordinary ray is eliminated and only the extra

ordinary ray is transmitted through the prism.

A calcite crystal PQRS about three times as long as it is wide is taken. Its ~~ends~~ and faces PS and QR are cut such that the angles in the principle selection ~~beat~~ becomes 68° and 112° insted of 71° and 109°. The crystal is then cut apart along the plane P'R' and perpendicular to both the principle.





selection and the end faces P's and SR'. The two cut surface are ground and polished optically flat. There are then cemented together by canada balsam which is a transparent liquid of refractive index 1.55 for sodium light. The crystal is then inclosed in a tube blackened inside.

Action :→ When a ray Am of unpolarised light nearly parallel to SR' is incident on the face P's it is up in to two refracted rays are plane polarised. The O-ray has vibration perpendicular to the principle section of the crystal and the

Notations

E-ray has vibration in principle section.
Now the refractive index of canada balsam (1.55) is less than the refractive index of calcite for the o-ray (1.658). but greater than the refractive index of calcite for the E-ray (1.486). Therefore When the o-ray reaches the layer of canada balsam. It is passing from an optically denser to a rarer medium. Hence the o-ray is totally reflected at calcite-balsam surface and is absorbed by the tube containing the crystal. Since E-ray is plane-polarised the light emerging from the Nicol is plane polarised with vibrations parallel to the principle section. These vibration are parallel to the shorter diagonal of the end face of the crystal. In this we can produce plane polarised light with the help of a Nicol prism.

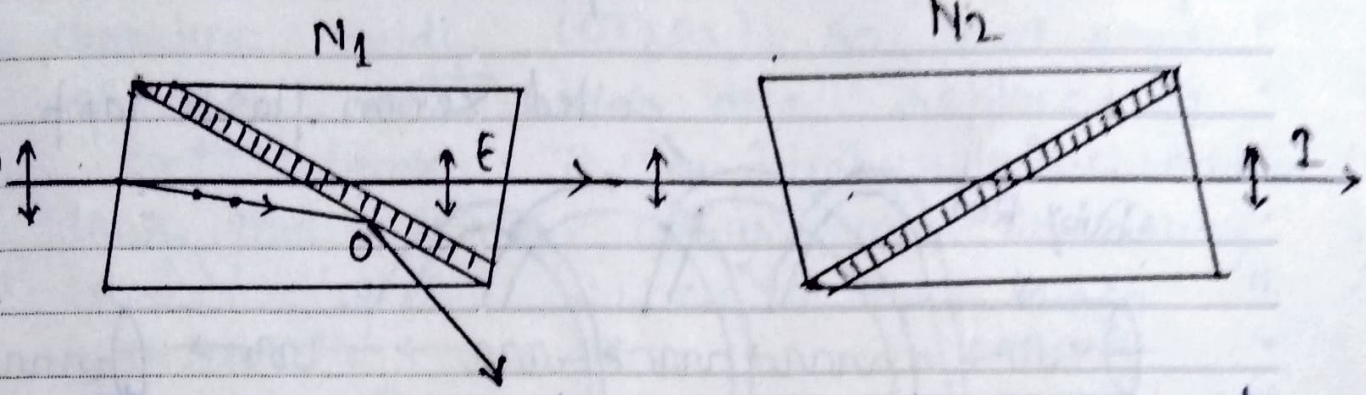
Uses :→ The Nicol prism be used both as a polariser and analyser

When unpolarised beam of light is incident on a Nicol prism N_1 the light emerging out of it is plane polarised and has vibration parallel to its principle section. If Now this light is made to pass through a second Nicol N_2, the principle section of which is parallel to its principle section and hence are completely transmitted as shown in fig. The intensity of the emergent beam is maximum.

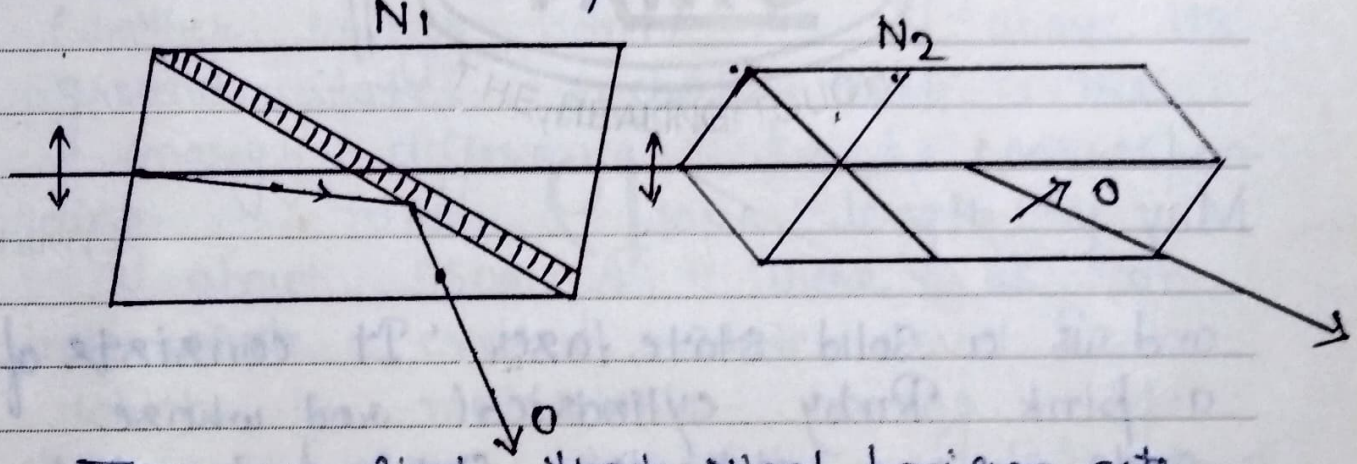
Now if the Nicol N_2 is rotated such that its principle section becomes perpendicular to that of N_1. then the vibration of incident light as o-vibrations for N_2. Hence no light emerges from the second Nicol N_2. In this position the two Nicols are said to be crossed.

When the Nicol N_2 (analyser) is further rotated. the two Nicol are again in parallel position. In this

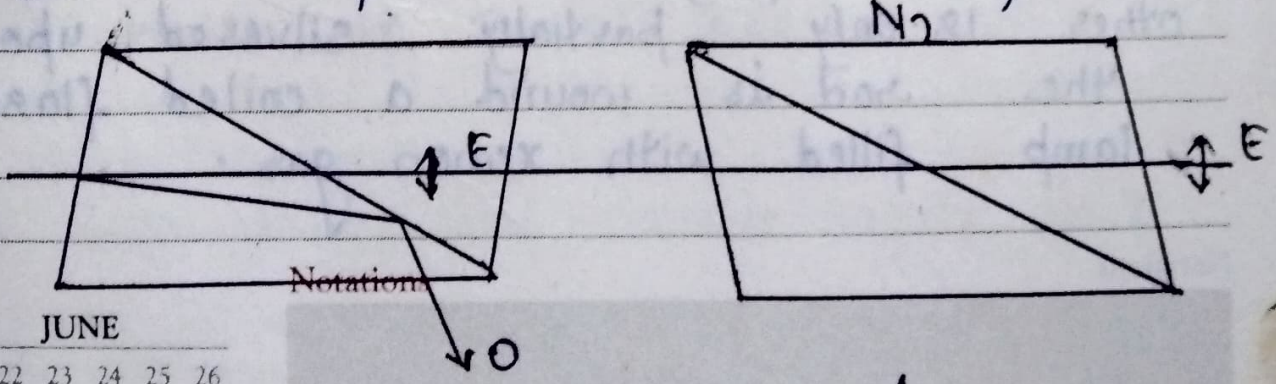
the E-ray is again transmitted through the Nicol N_2.



The first Nicol polarises the light and is called polariser. The second Nicol analyses the polarised light and is called the analyser.



Thus we find that Nicol prism acts both as a polariser and an analyser.



Notation

The End