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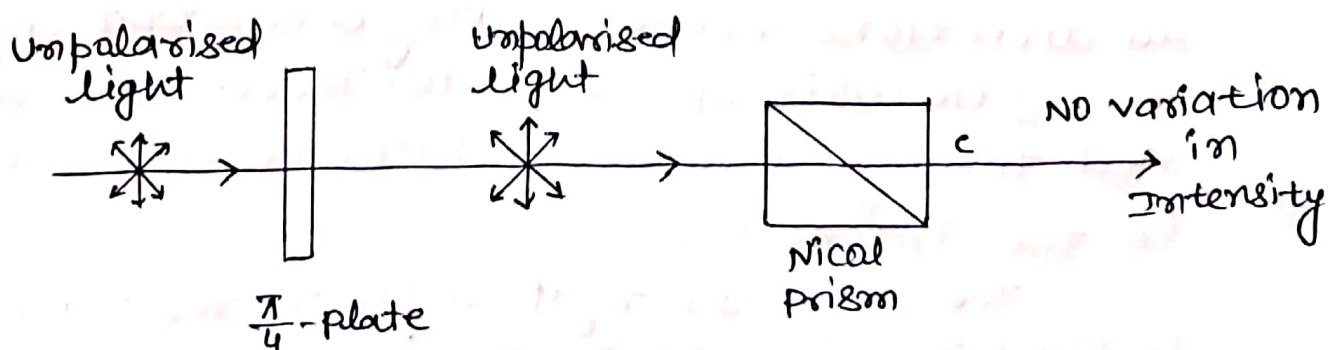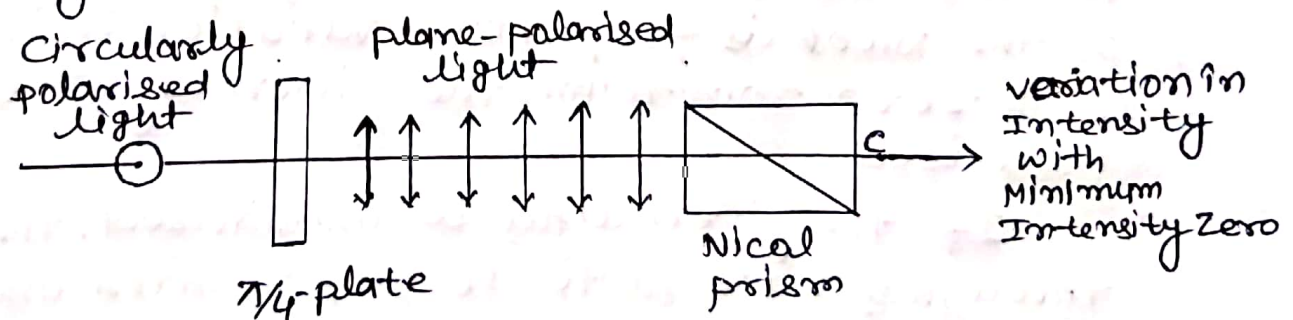Raja Singh College, Siwan

Distinction between circularly-palarised and Unpalarised Light.

When circularly-palarised light is passes through a Nicol prism which is rotated about the direction of light as axle, no variation in the intensity of the emergent light is observed. This is because inside the Nical the circularly-palarised light is broken up in to two plane palarised components of equal amplitude, having vibration parallel and perpendicular to the principal Section of the prism. The perpendicular components is lost by total reflection, while parallel components is transmitted. Since the Same happens in all positions of the Nicol prism, the intensity of the emergent light is always the Same.

Circularly polarised light   plane-palarised light   Nical prism   variation in Intensity with Minimum Intensity Zero   π/4-plate

Unpalarised light   unpalarised light   Nical prism   NO variation in Intensity   π/4-plate

For exactly the same reason an unpolarised light shows no variation in intensity of rotation of the Nicol prism.

To distinguish between the two, the light is first made to pass normally through a quarter-wave plate, and then examined through the rotating Nicol. If the given light is circularly polarised, then on entering the quarter-wave plate it will be broken up into two components of equal amplitudes having a phase difference of $\pi/2$. The quarter-wave plate will introduce a further phase change of $\pm\pi/2$ so that the phase difference between the two components on emergence will be either 0 or π. In either case the emergent light will be plane-polarised. Hence if this be examined through a rotating nicol, the intensity will be ~~plane~~ maximum when the principal section of the Nicol is parallel to these vibration in the emergent plane polarised light, light will be completely cut off when the principal section of the Nicol is perpendicular to these vibrations. Hence if the rotation of the Nicol ~~is perp~~ shows variation in intensity with zero minimum, the given light is circularly polarised.

If the given light be unpolarised, then on passing through q-wave plate, it will remain unchanged. This is because the unpolarised light have vibration in all directions, nevers making a constant angle with the optic axis of the plate. Therefore, when examined through a rotating Nicol it shows no variation in the intensity.

The plane at right angle to the plane of vibration in which no vibration occurs is known as the plane of polarisation.