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Home Assignment

(1) Can a beam of white light when passed through a hollow prism give spectrum?

Ans. No, this is because dispersion of light cannot occur through a hollow (containing air) prism.

(2) Why do different components of white light deviate by a different amounts when passed through a prism?

Ans. Light of different colours travels at different speed inside glass prism. Hence, refractive index of prism is different for different colours. And that is the reason why different colours deviate at different angles.

The refractive index of glass is largest for violet colour and least for red colour due to which violet colour is dispersed

the maximum and red colour the least.

(3) The angle of prism is 60°. equal is the angle of incidence for minimum deviation for the prism with refractive index $\sqrt{2}$.

ans. for maximum angle of deviation we have angle of incidence is equal to angle of emergence. $i = e$

$$i = \frac{A + \delta_m}{2}, \text{ where } \delta_m \text{ is the maximum deviation angle.}$$

$$\mu = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\frac{A}{2}}$$

$$\Rightarrow \sqrt{2} = \frac{\sin i}{\sin 60/2}$$

$$\Rightarrow \sin i = \sqrt{2} \times \sin(30)$$

$$\Rightarrow \sin i = \sqrt{2} \times 1/2$$

$$\Rightarrow \sin i = \frac{1}{\sqrt{2}}$$

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→ $i = 45^\circ$

In order that a ray suffers minimum deviation it should be incident at an angle of 45°.