Homework

Q1. Can a beam of white light when passed through a hollow prism give spectrum? Explain.

ans- Yes, a beam of white light when passed through a hollow prism it can give spectrum. When a beam of white light is passed through a glass prism, it splits up into a band of seven colours. This band of seven colours obtained on a screen on passing white light through a prism is called a spectrum. As all the colours in this spectrum are visible to our eyes, it is rightly called a visible spectrum.

Q2. Why do different components of white light deviate by a different amounts when passed through a prism?

ans- Different colours of light are characterized by their different wavelengths or frequencies. All these colours travel in air/vacuum with the same speed but their speeds in any other refracting medium (like glass or water) are different. The cause of dispersion is that different colours of white light having different wavelengths deviate through different angles on passing through a glass prism.

Q3. The angle of Prism is 60 degrees. What is the angle of incidence for minimum deviation for the prism with refractive index $\sqrt{2}$.

ans- At dm,

$i = e$.

$\therefore \quad i + i = A + dm$

$\Rightarrow \quad i = \frac{A+dm}{2} \quad ---(1)$

We know that refractive index of prism is given by.

$$\mu = \frac{\sin\left[\frac{A+dm}{2}\right]}{\sin\left[\frac{A}{2}\right]} \quad ---(2)$$

$\Rightarrow \mu = \frac{\sin(i)}{\sin\left[\frac{A}{2}\right]}$ [from (1) & (2)]

$\Rightarrow \quad \mu \times \sin\left[\frac{A}{2}\right] = \sin(i)$

$\Rightarrow \quad \sin(i) = \sqrt{2} \times \sin\left(\frac{60^\circ}{2}\right) = \sqrt{2} \times \sin 30^\circ$

$= \sqrt{2} \times \frac{1}{2} = \frac{1}{\sqrt{2}}$

$\Rightarrow \quad i = \sin^{-1}\frac{1}{\sqrt{2}} = 45^\circ$.

$\therefore$ The angle of incidence is 45°.