

Homework

1. No, when a beam of light passes through a prism, there is no spectrum.

Actually, spectrum is produced by the deviation of different colours due to the refraction of light. When a white light passes through the hollow prism, it escapes out as if entered because no refraction takes place.

2. The different components of white light deviate by different amounts when passed through prism because the amount of refraction depends on the speed of coloured light since different colours travel at different speeds they are refracted by different angles on passing through glass prism.

3. A prism of refractive index $\sqrt{2}$ has refracting angle 60°

As per the given criteria,
refractive index of prism, $\mu = \sqrt{2}$

Angle of the prism, $A = 60^\circ$

For minimum angle of deviation we have angle of incidence is equal to angle of emergence, i.e., $i = e$

Hence, $i = \frac{A + \delta_m}{2}$, where δ_m is the minimum deviation angle.

We know,

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

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

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

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

⇒ Multiply and divide by $\sqrt{2}$

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

$$\Rightarrow i = 45^\circ$$