

Q. For a glass prism ($\mu = \sqrt{3}$), the angle of minimum deviation is equal to the angle of the prism. Find the angle of the prism.

Ans. The relationship between refractive index, prism angle A and angle of minimum deviation is given by

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

Here,

\therefore Given,

$$D_m = A$$

Substituting the value, we have

\therefore

$$\mu = \frac{\sin A}{\sin \frac{A}{2}}$$

On solving, we have

$$= \frac{2 \sin \frac{A}{2} \cos \frac{A}{2}}{\sin \frac{A}{2}} = 2 \cos \frac{A}{2}$$

\therefore

$$\mu = \frac{\sin A}{\sin \frac{A}{2}} = \frac{2 \sin \frac{A}{2} \cos \frac{A}{2}}{\sin \frac{A}{2}} = 2 \cos \frac{A}{2}$$

For the given value of refractive index,
we have

\therefore

$$\cos \frac{A}{2} = \frac{\sqrt{3}}{2}$$

or

$$\frac{A}{2} = 30^\circ$$

\therefore

$$A = 60^\circ$$

This is the required value of prism angle.