Answer on Question #52367-Physics-Optics

What is the maximum value of angle of prism if it is equal to minimum deviation ($\mu = \frac{3}{2}$)

Solution

Angle of minimum deviation is $\delta_m = A$.

Angle of the prism is A.

Refractive index of prism is $\mu = \frac{3}{2}$.

The angle of deviation is related to refractive index as:

$$\mu = \frac{\sin\frac{(A+\delta_m)}{2}}{\sin\frac{A}{2}} = \frac{\sin\frac{(A+A)}{2}}{\sin\frac{A}{2}} = \frac{2\sin\frac{A}{2}\cos\frac{A}{2}}{\sin\frac{A}{2}} = 2\cos\frac{A}{2}.$$

Thus, the maximum value of angle of prism is

$$A = 2\cos^{-1}\frac{\mu}{2} = 2\cos^{-1}\frac{3}{4} = 82.82°.$$

Answer: $82.82°$.