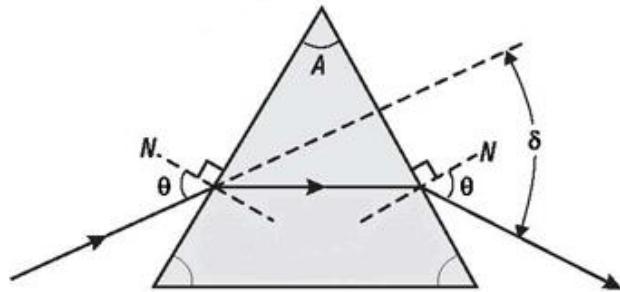


Answer on Question #38971, Physics, Optics

For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index

- (1) Lies between $2^{1/2}$ and 1
- (2) Lies between 2 and $2^{1/2}$
- (3) Is less than 1
- (4) Is greater than 2

Solution:



The refractive index n , angle of minimum deviation δ of light through a prism with refracting angle A are related by the following formula:

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

We have $\delta = A$

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

When $\delta = A$, these angles can change in range from 0 to 90 degrees.

$\cos(0^\circ) = 1$, then $n = 2$.

$$\cos\left(\frac{90^\circ}{2}\right) = \cos(45^\circ) = \frac{\sqrt{2}}{2}, \text{ then } n = \sqrt{2}.$$

Thus n lies between 2 and $\sqrt{2}$.

Answer. (2) Lies between 2 and $2^{1/2}$.