

Answer on Question #47751, Physics, Optics

Using a 30,60&90 triangular glass prism of refractive index=1.5 draw the ray diagram if the ray is incident perpendicular on any side.

Solution:

We know that total internal reflection occurs when traveling from a more dense to less dense material, we also know that the critical angle will be the angle of incidence that creates an angle of refraction of 90 degrees.

$$\begin{aligned}1.5 \sin i &= 1 \cdot \sin 90^\circ \\1.5 \sin i &= 1 \\i &= \sin^{-1} \left(\frac{1}{1.5} \right) = 41.81^\circ\end{aligned}$$

This means that if an angle of incidence in glass were greater than 41.81 degrees it would result in total internal reflection.

In our case the angle of incidence in glass is $i_1 = 60^\circ$ and $i_2 = 30^\circ$

Thus,

$$\begin{aligned}\frac{\sin i_2}{\sin r_2} &= \frac{1}{n} = \frac{1}{1.5} \\ \sin r_2 &= n \cdot \sin i_2 = 1.5 \cdot \sin 30^\circ = 0.75 \\ r_2 &= \sin^{-1} 0.75 = 48.59^\circ\end{aligned}$$

Answer:

