

Answer on Question #43117-Physics-Optics

a light ray initially in water enters a transparent substance at an angle of incidence of 37degree and the transmitted ray is refracted at an angle of 25degree calculate the speed of light in the transparent substance

Solution

Refraction index of water $n_1 = 1.33$.

Incident angle is $\theta_1 = 37^\circ$.

Refracted angle is $\theta_2 = 25^\circ$.

Snell's law:

$$n_1 \sin \theta_1 = n_2 \sin \theta_2 .$$

We want to find n_2 (refraction index of substance):

$$n_2 = \frac{n_1 \sin \theta_1}{\sin \theta_2} = \frac{1.33 \cdot \sin 37^\circ}{\sin 25^\circ} = 1.89.$$

Speed of light in substance:

$$v = \frac{c}{n} = \frac{3 \cdot 10^8 \frac{m}{s}}{1.89} = 1.6 \cdot 10^8 \frac{m}{s}.$$

Answer: $1.6 \cdot 10^8 \frac{m}{s}$.