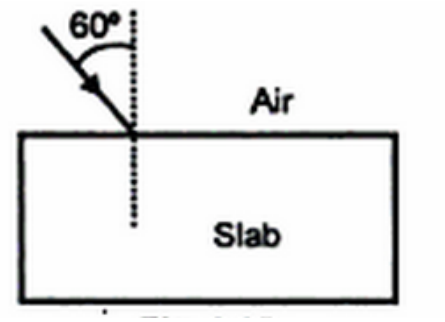
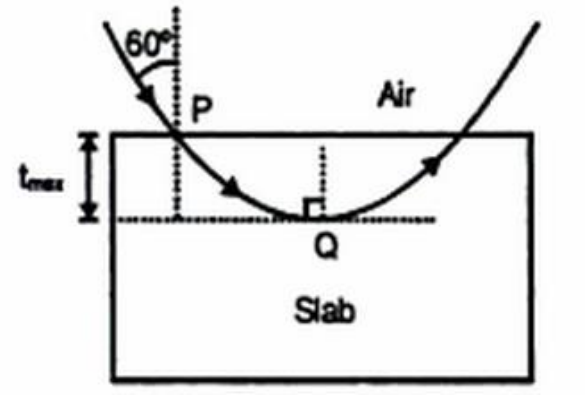
Answer on Question #52558-Physics- Optics

A ray of light enters into glass slab from air of incident angle 60° if refractive of glass slab is given by $\mu = A - Bt$ where A and B are constant and t is the thickness of slab measured from the top surface. Find the maximum depth travelled by ray in the slab. Assume thicknesses of slab to be sufficiently large?

Solution



The path of ray is curved as shown in the figure. As it travels successively into denser layers, it bends away from normal and TIR takes place at depth where angle of incidence approaches $\frac{\pi}{2}$.



Applying Snell's law at interfaces P and Q, we get

$$1 \cdot \sin 60° = \mu_B \sin \frac{\pi}{2}$$

$$or \frac{\sqrt{3}}{2} = (A - Bt_{max}) \cdot 1 \rightarrow t_{max} = \frac{1}{B}\left[A - \frac{\sqrt{3}}{2}\right].$$

Answer: $\boldsymbol{\frac{1}{B}\left[A - \frac{\sqrt{3}}{2}\right]}$.