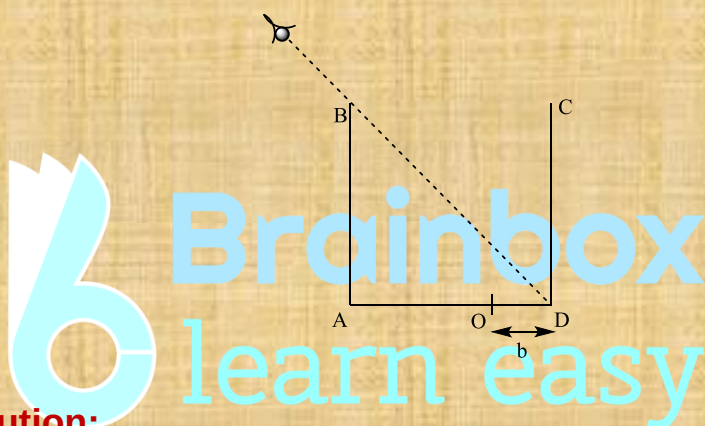


Chapter 04

REFRACTION OF LIGHT AT CURVED SURFACES

Example

A cubical vessel with opaque walls, is placed that the eye of an observer cannot see its bottom but can see the entire wall CD. A small object is placed at O at a distance $b = 10$ cm from corner D. What minimum depth of water should be poured into the vessel, which will enable the observer to see the object?

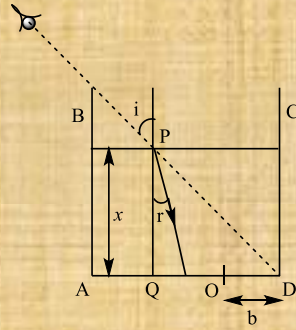
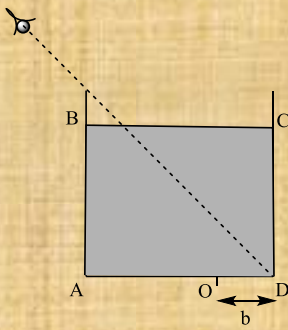


Solution:

Let the minimum depth of water be ' r '. Since the vessel is cubical ($AB = AD$), it is clear the angle $i = 45^\circ$. From Snell's law, the angle of refraction is given by

$$\sin r = \frac{\sin i}{n} = \frac{\sin 45^\circ}{4/3} = 0.5303,$$

$$\therefore r = 32.03^\circ.$$



Since $\angle QPD = 45^\circ$, $PQ = x = QD$

Hence, $QO = x - b$

Now, ΔPQO , $QO = x \tan r$

$$\Rightarrow x - b = x \tan r \Rightarrow x =$$

Substituting for b and r, we get,

$$x = 26.7 \text{ cm.}$$

