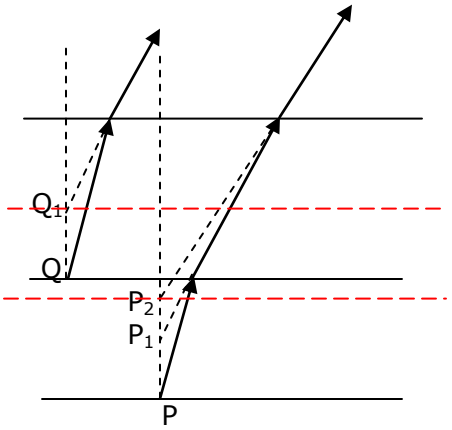
Q- A flint glass plate (n = 1.66) rests on the bottom of an aquarium tank. The plate is 8.00 cm thick and is covered with a layer of water (n = 1.33) 12.0 cm deep. Calculate the apparent thickness of the plate as viewed from straight above the water.

Consider a point P on the lower surface of the glass plate.



Depth of its image P_1 from water will be given by the formula for normal view

μ = real depth/ apparent depth

Or $$\frac{1.66}{1.33} = \frac{8.00}{h}$$

[1.66/1.33 is refractive index of glass relative to water]

Or h = 6.4 cm

This is the distance of the image from the upper surface of the plate as seen from water hence for outside of water the real depth of this image will be

12.0 + 6.4 = 18.4 cm

Hence the distance of image of point P from the surface of water P_2 is given by

μ = real depth/ apparent depth, as

Or 1.33 = 18.4/h'

Gives h' = 18.4/1.33 = 13.83 cm

Apparent depth of the image Q_1 of a point Q on the upper surface of the glass plate as seen from outside of water will be

h" = 12.0/1.33 = 9.02 cm

Hence apparent thickness of the plate from outside of water will be equal to the distance between the images of P and Q as seen from air and hence will be

t'= h' - h" = 13.83 - 9.02 = **4.81 cm.**