

An observer can see through a pin-hole the top end of a thin rod of height h , placed as shown in the figure. The beaker height is $3h$ and its radius h . When the beaker is filled with a liquid up to a height $2h$, he can see the lower end of the rod. Then the refractive index of the liquid is [2002-2 marks]

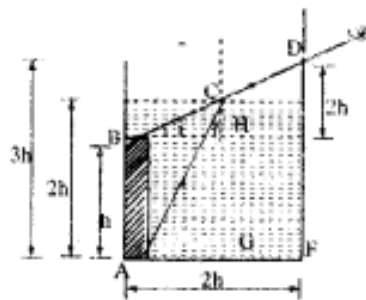
Sol-

(b) When liquid is filled in the beaker up to a height $2h$, the image of the lower end A of the rod AB is formed at B so that it is visible to the eye.

$$\therefore DE = EB = 2h$$

$$\therefore \angle i = 45^\circ \dots\dots(i)$$

$$\sin r = \frac{AG}{AC} = \frac{h}{h\sqrt{5}}$$



$$[\because AC^2 = (GC)^2 + (GA)^2]$$

$$\therefore \mu = \frac{\sin i}{\sin r} \quad \text{or} \quad \mu = \frac{\sin 45^\circ}{1/\sqrt{5}} \quad \text{or} \quad \mu = \sqrt{\frac{5}{2}}$$