① What are the two conditions required for total internal reflection?

ANS- The 2 conditions for total internal reflection of light to take place are:-

(i) Light has to travel from denser medium to rarer medium but not vice-versa.

(ii) Critical Angle of the medium.
$\theta_c = sin^{-1} \left[\dfrac{n_{rarer}}{n_{denser}} \right]$, n = refractive index.

Angle of incidence θ must be greater than the critical angle of medium θ_c.

② A fish in the pond of water appears at a depth of 6 cm. What is the actual depth of the fish if the refractive index of air w.r.t water is 3/4?

Ans.

$$u = \frac{real\ depth}{apparent\ depth}$$

$$u = 3/4$$

Apparent depth = 6 cm.

$$\frac{3}{4} = \frac{real\ depth}{6}$$

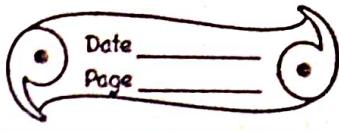$$real\ depth = \frac{3 \times 6}{4} \quad \frac{3}{2} = \frac{9}{2} = 4.5\ cm$$

③ A Rectangular glass slab of thickness 8 cm is placed on a figure. The eye is kept exactly above this slab. If the refractive index of glass is 1.6, then by what distance the figure will appear to raised?

$$Apparent\ depth = \frac{real\ depth}{Refractive\ index}$$

$$Apparent\ depth = \frac{8}{1.6}$$

$$= \frac{80}{16} = 5\ cm$$

real depth - apparent depth = shift

$\Rightarrow$ 8 - 5 = 3 cm.

So, fig ① creased will appear to be raised by 3cm.