



$\sin i = \frac{v_1}{v_2} = \frac{\mu_2}{\mu_1}$
 $\sin r = \frac{v_2}{v_1} = \mu_1$
 $\mu = \frac{\text{real depth}}{\text{apparent depth}}$
 $M = \left(1 - \frac{1}{\mu}\right) t = \text{image shift}$




- Pole is taken as origin
- Principle axis as the X-axis
- All distance measured from origin (or pole).
- All distance measured in the direction of incident ray is taken +ve.
- All distance measured in the direction opposite to the incident ray is taken -ve.

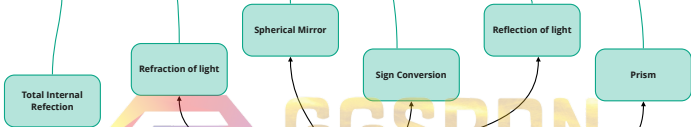
Angle of deviation $\delta = i - i' - A$
 $\delta_{\text{minimum}} = 2i - A \quad [i = i'] \rightarrow$
 $\delta_{\text{minimum}} = (\mu - 1)A$, if A is small



When ray passes from optically denser to rarer medium. If incident angle (i) further increased than (θ_c) critical angle entire light is then reflected back to the denser medium again is called T.I.R. It is used in optical fibre.

$\frac{1}{u} + \frac{1}{v} = \frac{2}{R} = \frac{1}{f}$
 Lateral Magnification = $\frac{h_2}{h_1} = \frac{v}{u}$

- $\angle i = \angle r$
 - Incident ray reflected ray and normal to the reflecting surface are coplanar
- 



$\frac{1}{v} - \frac{1}{u} = \frac{\mu_2 - \mu_1}{\mu_1} \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$
 $\frac{1}{f} = \left(\frac{\mu_2}{\mu_1} - 1 \right) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$
 $\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$ [If $\mu_2 = \mu, \mu_1 = 1$ (air)]
 $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ (lens formula)
 Lateral Magnification = $\frac{h_2}{h_1} = \frac{v}{u}$

Incident angle (θ_0 for which angle of refraction is 90°)
 i.e. $\sin \theta_c = 1 / \mu$
 $\theta_c = \sin^{-1} \left(\frac{1}{\mu} \right)$
 When ray passes from optically denser to rarer medium.

$\frac{\mu_1}{v} - \frac{\mu_2}{u} = \frac{\mu_2 - \mu_1}{R}$
 Lateral Magnification
 $m = \frac{h_2}{h_1} = \frac{\mu_1 v}{\mu_2 u} = \frac{R - v}{R - u}$

Light scattered i.e. redirected in different paths when interacts with particle matters e.g. sunset, sunrise, colours, blue colour of sky

Critical Angel
Power of a lens
 $P = \frac{1}{f}$
 [For combination of lens]
 $P = \frac{1}{f_1} + \frac{1}{f_2}$

Optical Instruments

Optical Instruments

Optical Instruments

Optical Instruments

Optical Instruments

$M = 1 + \frac{D}{f}$ [image at near point]
 $M = D / f$ [image at infinite]

$M = \frac{v}{u} \left[\frac{D}{f} \right]$ [normal adjustment]
 $M = \frac{v}{u} \left(1 + \frac{D}{f} \right) = -1 \left(1 + \frac{D}{f} \right)$
 For final image at least distance

$M = \frac{f_e}{f_o} \left(1 + \frac{f_e}{D} \right)$ [image at near point]
 $M = -\frac{f_o}{f_e}$ [image at infinite]