B.SC Part - II

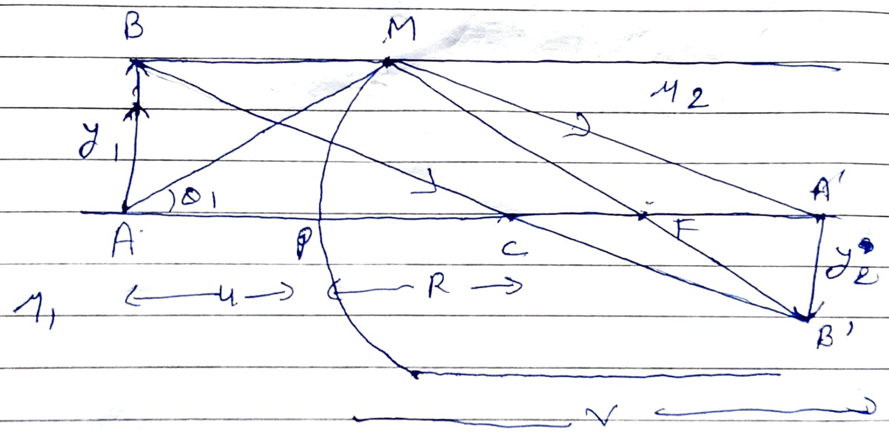
Suveta Sinha

Lateral Magnification (spherical surface)

Lateral magnification or Linear magnification or transverse magnification (m) is defined as ratio of size of image to the size of the object

$$m = \frac{A'B'}{AB} = \frac{y_2}{y_1}$$

Let a spherical refracting surface MPN seperating two medium of refracting index μ_1 and μ_2 respectively.



From Δ' ABC and A'B'C

$$\frac{A'B'}{AB} = \frac{A'C}{AC}$$

$A'B' = -y_2$

$AB = y_1$

$A'C = PA' - PC$

$A'C = v - R$

$AC = AP + PC$

$AC = -u + R$

Putting the value in eqⁿ (i)

$$-\frac{y_2}{y_1} = \frac{v - R}{-u + R}$$

$$\frac{y_2}{y_1} = \frac{R - v}{R - u} \quad \text{—— (ii)}$$

From Refraction formula

$$\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_1 - \mu_2}{R}$$

$$\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_1}{R} - \frac{\mu_2}{R}$$

$$\frac{\mu_1}{u} - \frac{\mu_1}{R} = \frac{\mu_2}{v} - \frac{\mu_2}{R}$$

$$\mu_1 \left(\frac{R - u}{uR}\right) = \mu_2 \left(\frac{R - v}{vR}\right)$$

$$\frac{\mu_1}{\mu_2} \times \frac{vR}{uR} = \frac{R - v}{R - u}$$

$$\frac{\mu_1}{\mu_2} \times \frac{v}{u} = \frac{R - v}{R - u} \quad \text{—— (iii)}$$

From eqⁿ (iii) and (ii)

$$\boxed{\frac{y_2}{y_1} = \frac{\mu_1}{\mu_2} \left(\frac{v}{u}\right)}$$

— x —