Optical instruments

→ Angle of vision of human eye is 60°

→ Min distance btw object & human eye is 25cm to see object clearly.

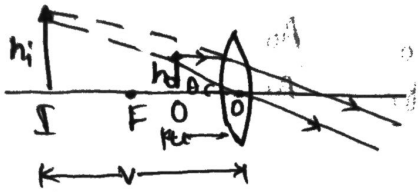
→ Least distance of distinct vision (D) = 25cm

→ Far point of eye = ∞ (Large distance).

→ Simple microscope (Magnifying glass):

Virtual, erect, enlarge image is formed.

magnifying power (or) angular magnification (M) (or) (m).



$m = D/u$

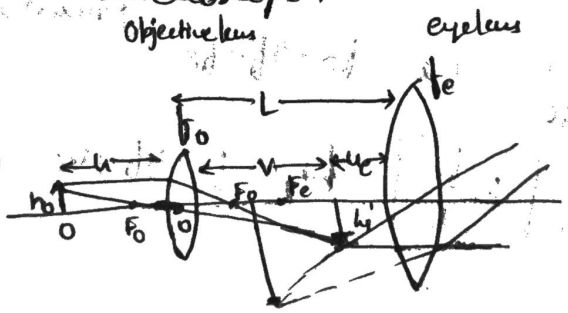
$1/f = -1/u$

D = distinct point of vision (near point)

$m_\infty = \frac{-D}{f}$

$m_D = 1 + D/f$

→ Compound microscope:



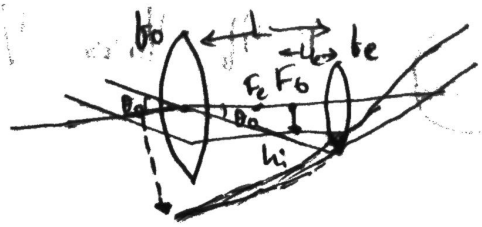
$m = m_o \times m_e$

(Magnification)

$m_\infty = \frac{-v_o}{u_o} \frac{D}{f_e}$ $\quad L_\infty = v_o + f_e$

$m_D = \frac{v_o}{u_o}\left[1 + \frac{D}{f_e}\right]$ $\quad L_D = v_o + u_e$

→ Astronomical telescope:



$m = -f/u_e$

$L = f_o + u_e$

$M_{\infty} = \frac{-f_o}{f_e}$ $L_{\infty} = f_o + f_e$ (Astro. magnification) (Normal adjustment)

$u_e = f_e$

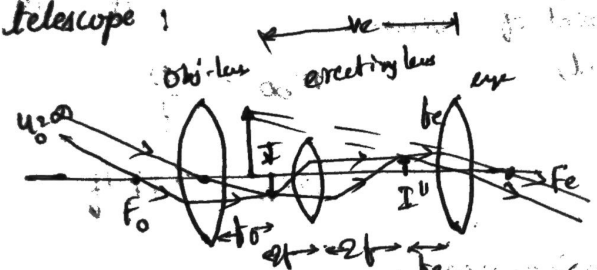
$M_D = \frac{-f_o}{f_e}\left[1 + \frac{f_e}{D}\right]$ $L_D = f_o + u_e = f_o + \frac{f_e D}{f_e + D}$

D = near point (Max. magnification)

→ If object & image both are at infinity then

$$\frac{f_o}{f_e} = \frac{A_o}{A_e}$$

Terrestrial telescope :



(Normal adjustment)

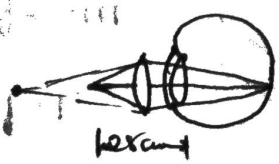
$M_{\infty} = \frac{-f_o}{f_e}$ $L_{\infty} = f_o + 4f + f_e$

$M_D = \frac{-f_o}{f_e}\left[1 + \frac{f_e}{D}\right]$ $L_D = f_o + 4f + u_e = f_o + 4f + \frac{f_e D}{f_e + D}$

Myopia (or) short sightness

$P = 1/f = -1/F \cdot P\,(m)$

Hypermetropia (or) long sight ness



$P = +1/f = 1/0.25 - 1/N \cdot P$