

Q- The minimum focal length of an eye lens is $f = 2.8$ cm and the distance between the lens and retina = 3.00 cm. Find the focal length of the lens to read a book at a distance of 25 cm from eye-lens.

The minimum focal length of the eye lens is $f = 2.8$ cm.

The distance between the lens and retina = 3.00 cm

1. The object distance is $u = -25$ cm.

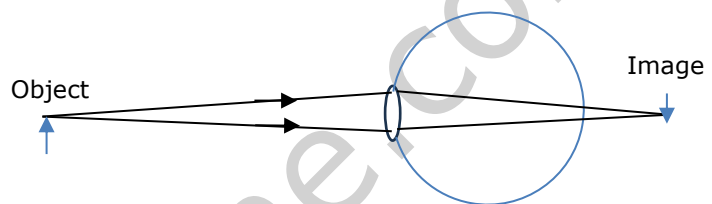
The image distance v from the lens is given by lens formula.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Gives $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

Or $\frac{1}{v} = \frac{1}{2.8} + \frac{1}{-25} = 0.32$

Gives $v = 3.15$ cm



Hence the distance of the image from the retina will be

$$3.15 - 3 = 0.15 \text{ cm to the right of the retina.}$$

2. As the image is to brought near the eye lens, a converging lens is required, which converges the rays more such that the image will be formed on the retina.

3. To form the image on the retina the total focal length of the combination required F is given by using the lens formula

$$\frac{1}{F} = \frac{1}{3.00} - \frac{1}{-25}$$

Or $F = 25 \times 3 / (25 + 3) = 2.68$ cm

Hence the focal length of the required lens f_l will be given by the formula of the combination of thin lenses we have

$$\frac{1}{F} = \frac{1}{f} + \frac{1}{f_l}$$

Gives $f_l = \frac{Ff}{f-F} = \frac{2.68 \times 2.8}{2.8 - 2.68} = 62.5$ cm

