Exercise

Q1) The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to

Ans) Accommodation.

Q2) The human eye forms the image of an object at its

Ans) Retina.

Q3) The least distance of distinct vision of a young adult with normal vision is about

Ans) 25cm

Q4) The change in focal length of an eye lens is caused by the action of the

Ans) Ciliary muscles.

Q) A person needs a lens of power −5.5D for correcting his distant vision. For correcting his near vision, he needs a lens of power +1.5D. What is the focal length of the lens required for correcting i) distant vision ii) near vision?

Ans) i) For distance viewing, $f = ?$, $P = -5.5D$

Clearly, $f = \frac{100}{P} = \frac{100}{-5.5} = -18.2\ cm$

ii) For near vision correction $P = +1.5D$

Therefore, $f = \frac{100}{P} = \frac{100}{1.5} = 66.7\ cm$

Q6) The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?

Ans) Distance of far point, $x = 80$ cm $P = ?$

For viewing distant objects, focal length of corrective lens, $f = -x = -80$ cm

Thus, $P = \frac{100}{f} = \frac{100}{-80} = -1.25D$. The lens is concave.

Q12) Make a diagram how hypermetropia is corrected. The near point of a hypermetropic eye is 1 metre. What is the power of lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.

Ans) The object placed at 25cm from the converging lens must produce a virtual image at 1m or 100cm.

$\therefore u = -25\text{cm}, \quad v = +100\text{cm}$

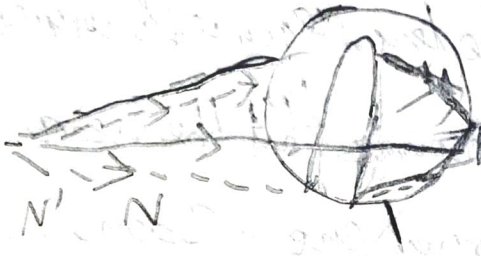
By lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-100} - \frac{1}{-25}$

$= -\frac{1}{100} + \frac{1}{25} = +\frac{3}{100}$

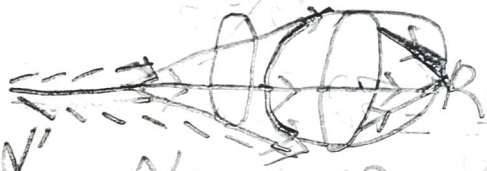
or $f = +\frac{100}{3}\,cm = +\frac{1}{3}\,m$

Power, $P = \frac{1}{f} = +\frac{3}{1} = +3D.$

Normal eye
(Sharp image of object at N (Near Point))



Hypermetropic eye
(Blurred image of an object at N (near point) sharp image of object at N')



Corrected hypermetropic eye
(Sharp image of object at N)

Figure