# NCERT X CLASS PHYSICS
## Chapter-2 - Human eye and colourful world

**Q.1** The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to
(A) presbyopia (B) accommodation (C) near-sightedness (D) far-sightedness

**Sol.** (B)

**Q.2** The human eye forms the image of an object at its –
(A) cornea (B) iris (C) pupil (D) retina

**Sol.** (D)

**Q.3** The least distance of distinct vision for a young adult with normal vision is about –
(A) 25 m (B) 2.5 cm (C) 25 cm (D) 2.5 m

**Sol.** (C)

**Q.4** The change in focal length of an eye lens is caused by the action of the –
(A) pupil (B) retina (C) ciliary muscles (D) iris

**Sol.** (C)

**Q.5** A person needs a lens of power –5.5 dioptres for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision?

**Sol.** (i) Focal length of distance viewing $= \frac{1}{\text{Power}} = \frac{-100}{5.5}\text{ cm} = -18\text{cm}.$

(ii) Focal length in near vision = 100/1.5 cm = 66.6 cm.

**Q.6** The far point of a myopic person is 80 cm. in front of the eye. What is the power of the lens required to enable him to see the distant objects clearly ?

**Sol.** A myopic person needs a concave lens for the correction of his eyesight.

His v = – 80 cm. (far point), u = ∞ (infinity)

So, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{f} = \frac{1}{v}$ (as $\frac{1}{\infty} = 0$)

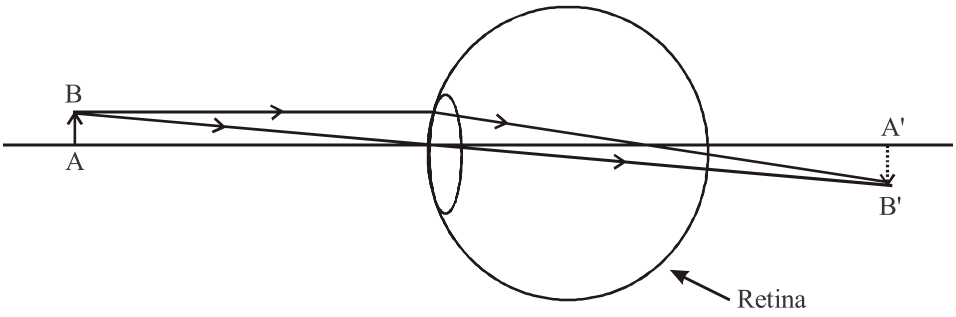
$\Rightarrow \frac{1}{f} = \frac{1}{-80}$

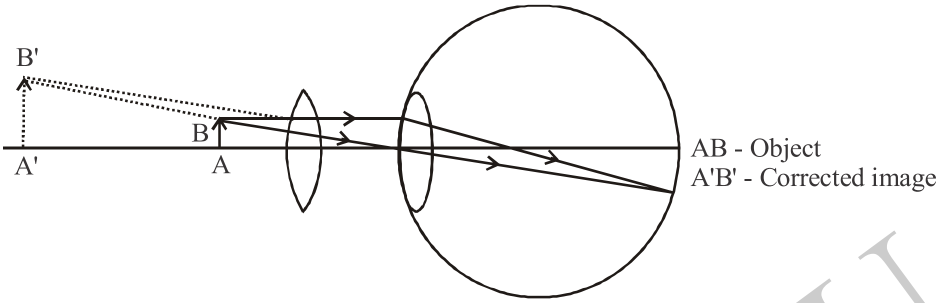
$\Rightarrow$ f = – 80 cm $\Rightarrow$ f = – 0.8 m.

$\therefore \; P = \frac{1}{-0.8} = -1.25\text{ D}$ (Dioptres)

**Q.7** Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.

**Sol.**




To correct the defect, the image of an object at 25 cm. should be brought at 100 cm.

$\therefore \ \frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{-100} - \frac{1}{-25}$ i.e., $\frac{1}{f} = \frac{-1}{100} + \frac{1}{25} = \frac{-1+4}{100} = \frac{3}{100}$ $\therefore \ f = +\frac{100}{3} = +33.3$ cm.

So a convex lens of focal length 33.3 cm. is required. Power, $P = \frac{100}{33.3} = 3.0$ D

**Q.8** Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

**Sol.** The maximum accommodation of a normal eye is reached when the object is at a distance of 25 cm. from the eye. The focal length of the eye lens cannot be decreased below this minimum limit. Thus, an object placed closer than 25 cm. cannot be seen clearly by a normal eye because all the power of accommodation has already been exhausted.

**Q.9** What happens to the image distance in the eye when we increase the distance of an object from the eye?

**Sol.** Remains same with the change in focal length of lens done with ciliary muscles.

**Q.10** Why do stars twinkle?

**Sol.** The twinkling of a star is due to atmospheric refraction of starlight. The atmospheric refraction occurs in a medium of gradually changing refractive index.
Since, the atmosphere bends starlight towards the normal, the apparent position of the star is slightly different from its actual position. This apparent position of the star is not stationary, but keeps on changing slightly, since the physical conditions of the earth's atmosphere are not stationary. Since the stars are very distant, they approximate point-sized sources of light. As the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering the eye flickers-the star sometimes appear brighter, and at some other time, fainter, which is the twinkling effect.

**Q.11** Explain why the planets do not twinkle.

**Sol.** Planets are nearer and are extended objects. The average of the light from all points in a planet is zero. So they do not twinkle.

**Q.12** Why does the Sun appear reddish early in the morning?

**Sol.** In the early morning (at the time of sunrise), when the sun is near the horizon, the sunlight has to travel the greatest distance through the atmosphere to reach us. During this long journey of sunlight, most of the blue colour and shorter wavelength present in it is scattered out and away from our line of sight. So, the light reaching us directly from the rising sun consists mainly of longer wavelength red colour due to which the sun appears reddish early in the morning.

**Q.13** Why does the sky appear dark instead of blue to an astronaut?

**Sol.** At very high altitudes, scattering is not prominent due to the absence of atmosphere, so sky appears dark instead of blue to an astronaut.