Chapter 11 Human Eye and Colourful World

Question 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
Answer: (b) accommodation

Question 2. The human eye forms the image of an object at its
(a) cornea
(b) iris
(c) pupil
(d) retina.
Answer: (d) retina.

Question 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.
Answer: (a) 25 cm

Question 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.
Answer: (C) ciliary muscles.

Question 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?
Answer: The focal length of a lens is given by –

$$(p = \frac{1}{f}),\ f = \frac{1}{p}$$

(i) For distant vision

$$f = \frac{1}{-5.5D} = -0.18 \text{ m}$$

(ii) For near vision

$$f = \frac{1}{p} \text{ i.e.,} f = \frac{1}{1.5D} = 0.67 \text{ m}$$

Question 6. 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?
Answer: For the myopic eye
u = – ∞
v = – 80 cm
f = ?

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

$\frac{1}{-80cm} - \frac{1}{-\infty} = \frac{1}{f}$

f = -80 cm = – 0.80 m

power of the lens is

p = $\frac{1}{f}$

p = $\frac{1}{-0.80m}$ = -1.25 D

A concave lens; p = -1.25 D

Question 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.

Answer: u = -25 cm,

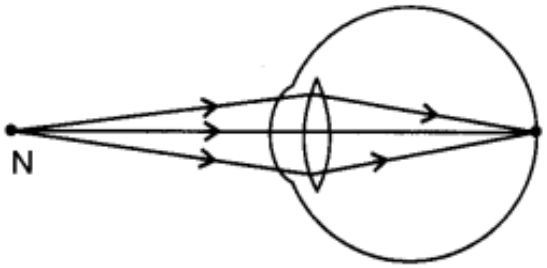
v = -1 m = -100 cm

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

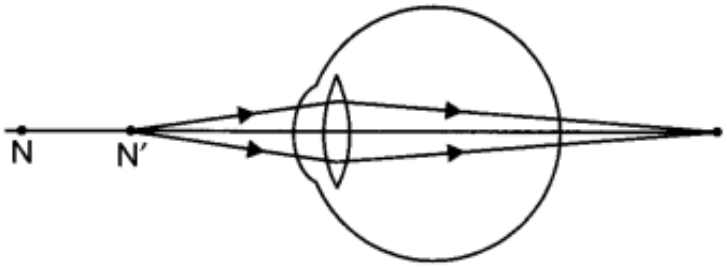
$$= \frac{1}{-100} - \frac{1}{(-25)} = \frac{-1}{100} + \frac{1}{25}$$

$$= \frac{1+4}{100} = \frac{3}{100} \text{ or } f = \frac{1}{3} \text{ m}$$

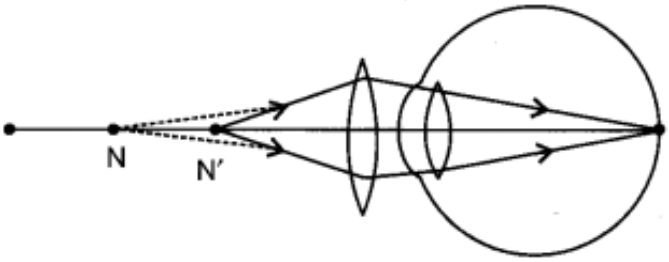
$$p = \frac{1}{f} = \frac{1}{1/3} = 3D \text{ (convex lens)}$$



(a) Near point of a Hypermetropic eye



(b) Hypermetropic eye



(c) Correction of Hypermetropic eye

Question 8. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?
Answer: Ciliary muscles can contract the Hypermetropic eye lens of the human eye to a certain limit because of which a person with normal vision can see the nearby objects clearly only if placed at 25 cm but if the object is placed closer to the eye than it cannot see the objects clearly.

Question 9. What happens to the image distance in the eye when we increase the distance of an object from the eye?
Answer: The image distance in the eye remains the same. On increasing the distance of an object from the eye, the focal length of the eye lens changes due to ciliary muscles which helps an eye to focus the object's image on the retina.

Question 10. Why do stars twinkle?
Answer: Stars twinkle due to atmospheric refraction of light from the stars and changing the density of the air around the earth.

Question 11. Explain why the planets do not twinkle.
Answer: Planets are much closer to earth and are big enough in size.

Question 12. Why does the sun appear reddish early in the morning?
Answer: When the sun rises early in the morning (or set in the evening), the light from the sun travels through the thicker layer of air and larger distance of the atmosphere surrounding the earth which makes the sunlight to scatter the most. Hence the blue light scatters the most but red light scatters the least and reaches our eyes.

Question 13. Why does the sky appear dark instead of blue to an astronaut?
Answer: In space, there are no particles, air, gases, water droplets etc., present to scatter the light. So when the astronauts look at the sky in the space, there is no light entering our eyes, hence it appears dark.