The Human Eye and the Colourful World

Solved Intext Exercises

Q1. What is meant by power of accommodation of the eye?

Sol. Power of accommodation of an eye is its power to be able to see nearby as well as far away objects.

Q2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

Sol. It should be concave (diverging) lens.

Q3. What is the far point and near point of the human eye with normal vision?

Sol. The far point of the human eye with normal vision is infinitely. The near point of the human eye with normal vision is 25 cm.

Q4. A student has difficulty in reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

Sol. The child could be suffering from myopia or near- sightedness. It can be corrected by using spectacles with concave lens of suitable power.

Solved NCERT Exercises

Q1. 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

(b) near - sightedness

(d) far - sightedness

Sol. Accommodation

Q2. The human eye forma the image of an object at its

(a) cornea

(b) iris

(c) retina

(c) pupil

Sol. retina

Q3. 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. 25 cm

Q4. 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. ciliary muscles

Q5. 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) For distant vision

Power of distant vision = –5.5 dioptres

We know,

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

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

$$f = \frac{1}{-5.5}$$

$$f = -0.181\, m = -18.1\, cm$$

Thus the focal length of lens for correcting distance vision is 18.1 cm and the lens is a concave lens.

(ii) For near vision

Power of near vision part of the lens is 1.5 dioptres

We know, We know,

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

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

$$f = \frac{1}{+1.5}$$

$$f = +0.667\, m = +66.7\, cm$$

Thus the focal length of the lens for correcting near vision is 66.7 cm and the lens is a convex lens.

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?

Sol. The person is myopic, therefore lens required for correction is concave lens

$u = \infty, v = -80\ cm, f = ?$

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

$$\frac{1}{f} = \frac{1}{-80} - 0$$

$$f = -80\ cm$$

Therefore,

$$P = \frac{1}{f}\ m$$

$$P = \frac{100}{-80}$$

$$P = 1.25\ D$$

Q7. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1m. What is the power of lens to correct this defect. Assume that the near point of normal eye is 25 cm.

Sol. $u = -25\ cm,\ v = -100\ cm, f = ?$

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

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

$$\frac{1}{f} = \frac{-1+4}{100}$$

$$\frac{1}{f} = \frac{3}{100}$$

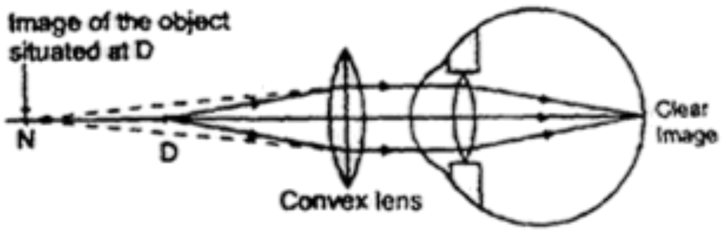
$$f = \frac{100}{3}\ cm$$

Now,

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

$$P = \frac{100}{\left(\frac{100}{3}\right)}$$

$$P = 3\ D$$



Q8. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

Sol. A normal eye is not able to see clearly objects placed closer than 25 cm because the focal length of the eye lens cannot be decreased below it.

Q9. What happens to the image distance in the eye, when we increase the distance of an object from the eye.

Sol. The distance image in the eye remains the same, i.e., distance of the retina from the eye ball.

Q10. Why do stars twinkle?

Sol. The twinkling of a star is due to the atmospheric refraction when the light coming from a star enters the earth's atmosphere, it undergoes refraction due to the different densities of air layers at various altitudes. The densities of atmosphere are continuously changing due to this atmosphere refracts the light from the stars by different amounts from one moment to the next. When the atmosphere refracts more star - light towards us, the star appears to be bright and when the atmosphere refracts less star - light, then the star appears to be dim. In this way, the star - light reaching our eyes increases and decreases continuously due to atmospheric refraction. And the star appears to twinkle at night.

Q11. Explain why the planets do not twinkle.

Sol. The planets appear to be quite big to us. So, a planet can be considered to be a collection of a very large number of point sources of light. The dimming effect produced by some of the point sources of light in one part of the planet is nullified by the brighter effect produced by the point sources of light in its other part. Thus, on the whole, the brightness of a planet always remains the same and hence it does not appear to twinkle.

Q12. Why does the sun appear reddish early in the morning?

Sol. At the time of sunrise or sunset, the position of the sun is very far away from us. The sunlight travels longer distance through the atmosphere of the earth before reaching our eyes. Scattering of blue light is more than the scattering of red light. As a result of this, more red light reaches our eyes than any other colour. Hence sunset and sunrise appear red.

Q13. Why does the sky appear dark instead of blue to an astronaut?

Sol. The sky appears blue to us due to scattering of light by the atmosphere in space, there is no atmosphere, hence no scattering takes place. Hence, the sky appears black to an astronaut.