NCERT Solutions for Class 10 Science Chapter 10 – The Human Eye and the Colourful World

Intext Questions with Solutions of Class 10 Science Chapter 10 – The Human Eye and the Colourful World

1.

What is meant by power of accommodation of the eye?

Ans: The eye lens thins when the ciliary muscles are relaxed. As a result, the focal length increases and the eyes can clearly see far-off objects.

The ciliary muscles contract to make the eye lens thicker so that the surrounding things can be seen clearly. As a result, the eye lens's focus length is shortened, allowing the eyes to see the surrounding things.

As a result, the human eye lens may change the focus length to perceive objects on the retina that are close and far away. The eye's capacity for accommodation is referred to as this ability.

2.

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?

Ans: A concave lens with a focal length of 1.2 meters should be utilized by an individual who has a myopic eye in order to restore the individual's desired level of vision.

3.

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

Ans: The near point of the eye is the smallest distance at which an item can be clearly perceived without effort. It is 25 cm from the eye of a normal individual.

The farthest the eye can see objects clearly is known as the far point of the eye. A normal person's eye has a distant point of infinity.

4.

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

Ans: A student struggles to read the chalkboard from the final row. It signifies that he is unable of perceiving distant objects with clarity.

The student is experiencing myopia. This aberration can be rectified with a concave lens.

Exercise Questions with Solutions of Class 10 Science Chapter 10 – The Human Eye and the Colourful World

1.

The human eye can focus on 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.

Ans: (b) Accommodation

2.

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

Ans: (d) Retina

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.

Ans: (c) 25 cm

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.

Ans: (c) Ciliary muscles

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?

Ans:

(i) ∵ Power of distant viewing part of the lens,
$P_1 = -5.5$ D
∴ Focal length of this part, $f_1 = \dfrac{1}{P_1} = \dfrac{1}{-5.5}$ m
$= -0.181m = -1.81cm$
(ii) For near vision,
∴ Focal length of this part, $f_1 = \dfrac{1}{P_1} = \dfrac{1}{+1.5}$ m
$= 0.667$ m $= 6.67cm$

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?

Ans: Specifically, the individual is experiencing myopia. Within this deficiency, the picture is produced in front of the retina rather than behind it. For this reason, a concave lens is utilized in order to rectify this impairment in eyesight.

Object distance $(u) = \text{infinity} = \infty$
Image distance $(v) = -80 \text{ cm}$
Focal length $= f$
According to the lens formula,

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

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

$$\frac{1}{f} = -\frac{1}{80}, f = -80 \text{cm or} - 0.8\text{m}$$

We Know,

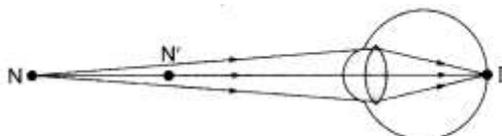Power, $P = \dfrac{1}{f(\text{in metres})}$

$$P = \frac{1}{-0.8} = -1.25 \text{ D}$$

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.
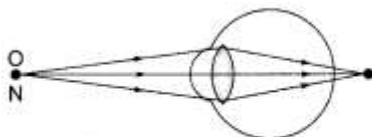
Ans:

i. The near point N of a hypermetropic eye is located at a greater distance than that of a normal near point N.
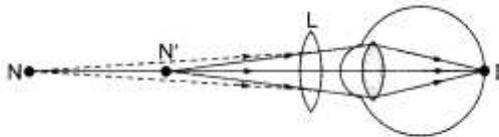

Near point of a hypermetropic eye

ii. In a hypermetropic eye, the image of a nearby object located at the normal near point N (25 cm) is formed posterior to the retina.

Hypermetropic eye

iii. Correction of hypermetropia: A convex lens creates a virtual image of an object positioned at the normal near point N, located at the near point N' of the eye.

Correction for hypermetropic eye

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

Therefore, u = – 25 cm, v = 100 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, $P = \frac{1}{f} = +\frac{3}{1} = +3D$

The positive sign shows that it is a convex lens.

8.

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

Ans: The typical human eye struggles to perceive objects positioned closer than 25 cm with clarity, as the ciliary muscles reach their contraction limit beyond this distance.

9.

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

Ans: The image distance remains constant since the size of the eyes cannot change.
When the object's distance from the eye increases, the image distance in the eye remains constant.

The increase in object distance is offset by a change in the focal length of the eye lens. The focus length of the eye fluctuates such that the image is always generated on the retina.

10.

Why do stars twinkle?

Ans: Atmospheric refraction makes stars look like they are twinkling. Light from stars bends and bends again as it travels through the Earth's atmosphere until it reaches the surface. Stars are really far away. So, they are the only source of light. The path of light from stars changes all the

time, which is why the stars seem to move and the light from them continually sparkling. This is what makes a star look bright sometimes and faint sometimes, which is what twinkling is.

11.

Explain why the planets do not twinkle.

Ans: The planets can be regarded as a major source of light because they are significantly closer to the earth than stars. The average change in the amount of light entering the eye from all point size light sources is zero if a planet is thought of as a collection of a very large number of point sources of light. As a result, the sparkling effect is eliminated.

12.

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

Ans: For an astronaut, the sky appears dark rather than blue because there is no atmosphere in deep space that might scatter sunlight.

Because sunlight does not scatter in space, astronauts do not see any scattered light, thus the sky appears black to them rather than blue.