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

✅ **Answer:**

The **power of accommodation** of the eye is the ability of the eye lens to **adjust its focal length** to clearly focus on both **near** and **distant objects** by changing its shape (thickness).

This is done with the help of **ciliary muscles**.

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

✅ **Answer:**

The person is suffering from **myopia (near-sightedness)**.

To correct it, a **concave lens (diverging lens)** of suitable focal length is used so that distant objects can be focused on the retina.

Q3. What is the far point of the normal human eye?

✅ **Answer:**

The **far point** of the normal human eye is **infinity**.

This means a normal eye can see distant objects as far as it wants.

Q4. What is the near point of the human eye with normal vision?

✅ **Answer:**

The **near point** of a normal human eye is **25 cm**.

This is the closest distance at which objects can be seen clearly without strain.

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Q1. What is the function of iris in the human eye?

✅ **Answer:**

The **iris** controls the **size of the pupil**, thereby regulating the amount of **light entering** the eye.

It acts like a natural diaphragm.

Q2. How do we see nearby and distant objects?

✅ **Answer:**

- For **nearby objects**: **Ciliary muscles contract**, lens becomes **thicker**, focal length decreases.
- For **distant objects**: **Ciliary muscles relax**, lens becomes **thinner**, focal length increases.

  This adjustment is called **accommodation**.

Q3. What happens to the image distance in the eye when we increase the distance of an object from the eye?

✅ **Answer:**

The **image distance remains constant** (equal to the distance between lens and retina).

To maintain clear image, the **lens adjusts its focal length**.

Q4. Why do stars twinkle?

✅ **Answer:**

Due to **atmospheric refraction**. The starlight bends as it passes through layers of air with varying densities.

This causes **apparent position of stars to change** slightly, and they appear to twinkle.

Q5. Explain why the planets do not twinkle.

✅ **Answer:**

Planets appear larger and closer to Earth, so they act like a **collection of point sources**.

Twinkling effects **cancel out** due to averaging, hence they appear steady.

📘 Intext Questions – Page 199

Q1. Why does the sun appear reddish early in the morning?

✅ **Answer:**

At sunrise, sunlight travels a longer distance through the atmosphere.

Blue and shorter wavelengths scatter away, and only **red light reaches our eyes**, making the sun appear reddish.

Q2. Why does the sky appear blue?

✅ **Answer:**

Due to **scattering of sunlight** by the atmosphere.

Blue light (shorter wavelength) is scattered the most by air molecules, hence the sky appears blue to us.

EXERCISES

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

(b) accommodation.
➞ *Accommodation* is the process by which the eye adjusts the focal length of the eye lens using **ciliary muscles** to focus on near or distant objects.

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

(d) retina.
➞ The retina is the light-sensitive layer at the back of the eye where the image is formed. The retina sends visual signals to the brain via the optic nerve.

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

(c) 25 cm.
➞ This is the minimum distance at which the eye can focus clearly without strain. It's also called the near point.

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

(c) ciliary muscles.
➞ Ciliary muscles contract or relax to change the curvature of the eye lens, thus changing its focal length.

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 dioptres.
What is the focal length of the lens required for correcting
(i) distant vision, and
(ii) near vision?

Formula:

$$f = \frac{100}{P} \text{ (in cm)}$$

(i) Distant Vision:

$$P = -5.5\ D \Rightarrow f = \frac{100}{5.5} = -18.18\ cm$$

(ii) Near Vision:

$$P = +1.5\ D \Rightarrow f = \frac{100}{1.5} = +66.67\ cm$$

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?

Solution:
For distant vision, far point should be at ∞
Given:

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

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

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

$$\Rightarrow f = -80\ cm\ or\ -0.8\ m$$

$$\Rightarrow P = \frac{1}{f(in\ m)} = \frac{1}{-0.8}$$

$$= -1.25D$$

Answer:
Lens is concave in nature, with power = **–1.25 D**

Q7.

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 normal near point is 25 cm)

Solution:
Given:
Object distance u = −25 cm
Image distance v = −100 cm (since the eye forms image at 1 m)

Using lens formula:

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

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

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

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

$$\Rightarrow f = \frac{100}{3} = 33.33\ cm\ or\ 0.33\ m$$

$$\Rightarrow P = \frac{1}{f(in\ m)} = \frac{1}{0.33}$$

$$= +3.20\ \text{D}$$

Answer: Convex lens of **+3.0 dioptre** is required.
(*Diagram will show parallel rays converging after refraction to focus on retina.*)

Q8.

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

Answer:
Because the ciliary muscles cannot contract further to increase the curvature of the lens beyond a limit. Hence, the eye cannot focus the image of a very close object on the retina.

Q9.

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

Answer:
The image distance (distance between lens and retina) remains constant. Instead, the **focal length** of the lens adjusts due to the accommodation of the eye to keep the image focused on the retina.

Q10.

Why do stars twinkle?

Answer:
Stars appear to twinkle because of atmospheric refraction. As light from the star passes through layers of air with different densities, it bends randomly, causing the light's path to shift slightly. This makes the star appear to change position and brightness continuously.

Q11.

Explain why the planets do not twinkle.

Answer:
Planets are much closer to the Earth and appear as a collection of many light rays coming from a larger area. The atmospheric effects average out due to the extended size, so they do not appear to twinkle like point-sized stars.

Q12.

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

Answer:
In space, there is no atmosphere to scatter sunlight. Hence, astronauts see a **dark sky** (black), even during daytime, because scattering of light (which causes blue sky on Earth) doesn't happen in vacuum.