

# NYQs

"Next Year Questions"



## Human Eye and the Colorful World

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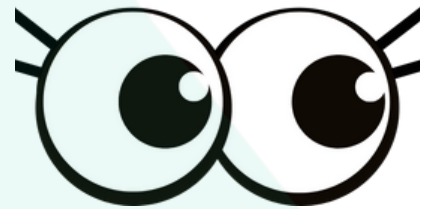
# The Human Eye and the Colourful World

**Q1. Which of the following phenomena of light are involved in the formation of a rainbow?**

- (a) Reflection, refraction and dispersion
- (b) Refraction, dispersion and total internal reflection
- (c) Refraction, dispersion and total internal reflection
- (d) Dispersion, scattering and total internal reflection

**Q2. When white light enters a glass prism from the air, the angle of deviation is least for**

- (a) blue light
- (b) yellow light
- (c) violet light
- (d) red light



**Q3. A person sees an object closer to his eyes. What changes will take place in his eyes?**

- (a) the pupil size will expand
- (b) the ciliary muscles will contract
- (c) the focal length of the eye lens will increase
- (d) the light entering the eye will be more

**Q4. Which of the following conditions is caused by the clouding of the lens in the eye?**

- A) Myopia
- B) Astigmatism
- C) Glaucoma
- D) Cataract

**Q5. Which of the following structures in the eye is responsible for changing the shape of the lens to focus light onto the retina?**

- A) Pupil
- B) Cornea
- C) Iris
- D) Ciliary muscle

**Q6.(a) List the parts of the human eye that control the amount of light entering into it. Explain how they perform this function?**

**(b) Write the function of retina in human eye.**

**Q7. Give reason: Lights of red color are used for danger signals**

**Q8. "Rainbow is an example of dispersion of sunlight." Justify this statement by explaining, with the help of a labelled diagram, the formation of a rainbow in the sky. List two essential conditions for observing a rainbow.**

**Q9. Why do stars appear to twinkle ? Explain.**

**Q10.(a) A person cannot read newspaper placed nearer than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate this defect. List its two possible causes. Draw a ray diagram to show how this defect may be corrected using a lens of appropriate focal length.**

**(b) We see advertisements for eye donation on television or in newspapers. Write the importance of such advertisements**

**Q11. Draw a ray diagram to show the refraction of light through a glass prism. Mark on it (a) the incident ray, (b) the emergent ray and (c) the angle of deviation.**

**Q12. Define the term power of accommodation. Write the modification in the curvature of the eye lens which enables us to see the nearby objects clearly?**

**Q13. (a) A person is suffering from both myopia and hypermetropia.**

**(i) What kind of lenses can correct this defect?**

**(ii) How are these lenses prepared?**

**(b) A person needs a lens of power +3 D for correcting his near vision and -3D for correcting his distant vision. Calculate the focal lengths of the lenses required to correct these defects**

**Q14. How will you use two identical glass prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw and label the ray diagram.**

**Q15. Why is Tyndall effect shown by colloidal particles?  
State four instance of observing the Tyndall effect.**

**10th Phodenge!**



# SOLUTION

Ans1. c

Ans2.d

Ans3. b

Ans4. d

Ans5. d



Ans6. (a) The part of the human eye that controls the amount of light entering into it is pupil.

Light enters the eye through a thin membrane called the cornea. It forms the transparent bulge on the front surface of the eyeball most of the refraction for the light rays entering the eye occurs at the outer surface of the cornea, the crystalline lens merely provides the linear adjustment of focal length required to focus objects at different distances on the retina. Iris which is behind the cornea controls the size of the pupil. The pupil regulates and controls the amount of light entering the eye.

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(b) Retina: It capture light and convert it into electric signals that are translated into images by the brain.

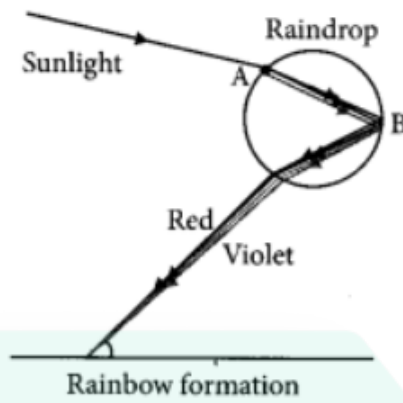
Ans7. Since the wavelength of light is maximum in the spectrum, its penetration power in the air is maximum and so we can see red colour from farther distances. Thus, danger signal uses red colour.

Ans8. After a rain-shower, the sunlight gets dispersed by tiny droplets, present in the atmosphere. The water droplets acts like small glass prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to dispersion of light and internal reflection, different colors reaches the observers eye, which is called a rainbow.

Two essential conditions for observing rainbow are

(i) Sun should be at the back of the observer.

(ii) Rainbow should be seen after rainfall or through a waterfall or water fountain.



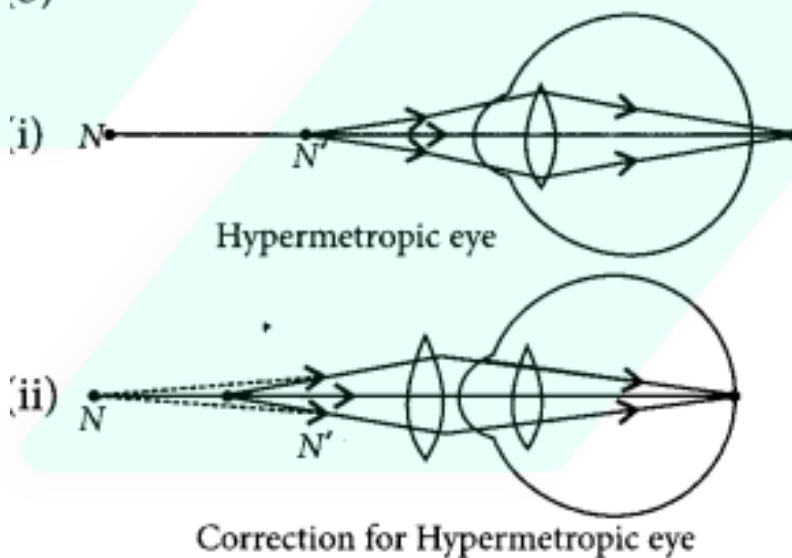
**Ans9.** Due to atmospheric refraction, position of star visible from sun, is slightly different from its actual position. This apparent position of the star is not stationary, but keeps on changing with change in physical condition on earth's atmosphere. Since the stars are very distant, they are approximately 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 appears brighter, and at some other time, fainter, which is the twinkling effect.

**Ans10.(a)** The person is suffering from hypermetropia.

**Hypermetropia :** It is a defect in an eye in which a person is not able to see nearby object distinctly but can see far objects clearly.

(a) Hypermetropia is caused due to following reasons:

- (i) Shortening of the eyeball
- (ii) Focal length of crystalline lens is too long.

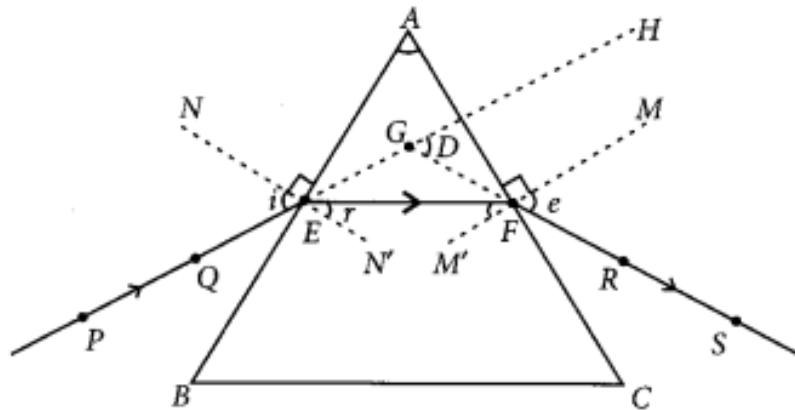


(b) It is important to advertise for eye donation on television or in newspaper because

- (i) Few people are unaware about the fact that there can be an eye transplant through which blind people can see this colourful and beautiful world.

(ii) To encourage them to donate their eye by spreading awareness about it through television or newspaper.

Ans11.



$i$  = angle of incidence

(a) PE = incident ray

(b) FS = emergent ray

(c)  $\angle D$  = angle of deviation

Ans12. The ability of the eye lens to adjust its focal length is called power of accommodation. The ciliary muscles modify the curvature to some extent. The change in the curvature of the eye lens can thus change its focal length. When the ciliary muscles contract, the lens becomes thick and its focal length decreases, thus enabling us to see nearby objects clearly.

Ans13.(a) (i) The lens which can correct the vision of such a person suffering from both myopia and hypermetropia is a bifocal lens.

(ii) A common type of bifocal lens contains both concave and convex lens. It is prepared with the upper portion consisting of a concave lens facilitating distant vision and the lower portion consisting of convex lens facilitating near vision,

(b)

The power required to correct near vision is:  $P_N = +3D$

Using the formula  $P = 1/f$ , the focal length of the convex lens needed is:

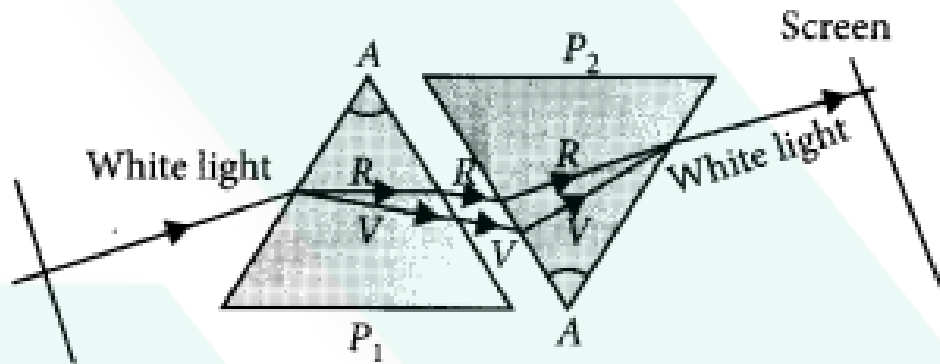
$$f_N = \frac{1}{P_N} = \frac{1}{3} \text{ m} = 0.33 \text{ m} = +33.33 \text{ cm}$$

The power required to correct distant vision is:  $P_D = -3D$

Using the same formula, the focal length of the concave lens needed is:

$$f_D = \frac{1}{P_D} = \frac{1}{-3} \text{ m} = -0.33 \text{ m} = -33.33 \text{ cm}$$

**Ans14.** Newton was the first to use a glass prism to obtain the spectrum of a white light. He then placed a second identical prism in an inverted position with respect to the first prism. This allowed all the colours of the white light to pass through the second prism combining to form a white light emerging from the other side of the second prism. This made him believe that white light was composed of different colours.



**Ans15.** The phenomenon of scattering of light by the colloidal particles give rise to Tyndall effect. When a beam of light strike colloidal particles, the path of the beam becomes visible. This is known as Tyndall effect.

This phenomenon can be observed when:

1. sunlight passes through a canopy of dense forest, when tiny water droplets in the mist scatter light.
2. torch light is switched on in a foggy environment, light rays are visible after being scattered by the fog particles in the surrounding air.
3. a fine beam of sunlight enters a smoke-filled room through a small hole.
4. shining a flashlight beam into a glass of diluted milk produces Tyndall effect.