

# Assignments in Science Class X

## Topic: - Human Eye and Colourful World

### IMPORTANT NOTES

#### 1. Parts of the Human Eye :

- A. **Sclerotic** is the outermost white fibrous covering of the eye.
  - B. **Cornea** is the transparent front bulging portion of the eye.
  - C. **Choroid** is a grey membrane attached to the sclerotic from the inner side.
  - D. **Retina** is a hemispherical screen formed by the nerve endings of the optic nerve which is sensitive to light.
  - E. **Optic nerve** is a bundle of approximately 70,000 nerves originating from the brain and entering the eye ball from the posterior side.
  - F. **Yellow spot** is a slightly raised area situated at the centre of the retina and has a very high concentration of nerve endings.
  - G. **Blind spot** is the region on the retina, where the optic nerve enters the eyeball. It has no nerve endings.
  - H. **Crystalline lens:** It is a double convex lens made of transparent tissue which help in focusing the image of the object on the retina.
  - I. **Ciliary muscles:** It is a ring of muscles which holds the crystalline lens and changes its focal length by contraction and expansion.
  - J. **Iris** is a circular contractile diaphragm suspended in front of the crystalline lens which has a circular hole in it and is commonly called **pupil**. The pupil controls the amount of light entering the eye.
  - K. **Vitreous humour** is a dense jelly-like fluid, filling the posterior portion of the eye. It protects the eyeball from collapsing.
  - L. **Aqueous humour** is a watery saline fluid filling the anterior portion of the eye. It keeps the cornea moist and prevents the front portion of the eye from collapsing.
2. **Accommodation of the Eye:** The process by which the ciliary muscles alter the focal length of the crystalline lens, so as to focus nearer or far-off objects clearly on the retina is called accommodation of the eye.
  3. **Short-sightedness or Myopia** is a defect in which a person can see clearly the nearer objects, but cannot see clearly the far-off objects.
  4. **Long-sightedness or Hypermetropia** is a defect in which a person can see clearly the far off objects, but cannot see clearly the nearer objects.
  5. **Presbyopia** is a defect in which a person cannot see clearly, the nearer or far-off objects.
  6. **Prism** is a piece of glass or any other transparent material bounded by two triangular and three rectangular surfaces.

7. When refraction of light takes place through a prism then : angle of incidence + angle of emergence = angle of prism + angle of deviation
8. A prism bends the rays of light towards its base.
9. **Dispersion** is the phenomenon due to which white light splits up into its component colours when passed through a prism.
10. Spectrum is the band of colours obtained on the screen, when white light splits on passing through the prism.
11. The order of colours in the solar spectrum is violet, indigo, blue, green, yellow, orange and red (VIBGYOR), such that red colour deviates the least and violet colour the most.
12. Dispersed white light (seven colours) can be recombined to form white light by placing another prism in inverted position in the path of dispersed light.
13. Rainbow is produced due to dispersion of sunlight by tiny droplets of water suspended in air, just after the rain.
14. Rainbow is always formed in the direction, opposite to the direction of the sun.
15. The different layers of the atmosphere have different optical densities. Thus, rays of light on passing through these layers, suffer refraction, which give rise to the phenomena such as twinkling of stars, the sun appearing bigger during sunrise or sunset, etc.
16. The phenomenon due to which colloidal particles scatter blue colour in white light is called Tyndall effect.
17. The phenomenon due to which a ray of light of a particular wavelength strikes a particle bigger than its wavelength, such that the light is first absorbed by the particle and then transmitted in all directions is called scattering of light.

## **VERY SHORT ANSWER QUESTIONS**

### **IMPORTANT QUESTIONS**

1. What do you understand by the term dispersion?
2. Define the term spectrum.
3. What is the role of retina?
4. Name the cells that respond to the intensity of light.
5. What is the main function of the ciliary muscles?
6. Which colours of white light are likely to scatter the most while passing through the atmosphere?
7. What do you mean by the “near point”?
8. What is the meaning of the “far point” of eye?
9. When do we say a person is colour-blind?
10. What is the focal length of the normal eye lens?
11. Name the eye defect that can be rectified by using a bifocal lens.
12. When two prisms, one up and one down in contact, receives white light, what colour of light will emerge out?
13. What is Tyndall effect?
14. What does the acronym VIBGYOR refer to?
15. Write the nature of image formed by our eye.
16. A mixture of orange and yellow light is dispersed through a prism. Which colour will deviate the least?
17. Which colour appears on the lower arc of a rainbow?

18. It stops raining at 4 p.m. and the sun comes up. In which direction is the rainbow formed?

## **QUESTIONS FROM CBSE EXAMINATION PAPERS**

1. What is the role of pupil in a human eye?
2. What is the range of vision of a normal human eye?
3. Name the part of the human eye that helps in changing the focal length of the eye lens.
4. Which coloured component bends the least during the dispersion of white light through prism?
5. Name the part of the eye
  - (a) that controls the amount of light entering into the eye.
  - (b) that has real, inverted image of the object formed on it.
6. A person is advised to wear spectacles with convex lenses. State the defect of vision he is suffering from.
7. Draw a ray diagram to show the angle of deviation when a ray of light passes through a glass prism.
8. When one enters a dim-lit room from bright light, one is unable to see the objects in the room for some time. Why?
9. What is meant by near point of a human eye?
10. A person is advised to wear spectacles with concave lenses. What type of defect of vision is he suffering from?
11. What will be the observed colour of the sky on a planet where there is no atmosphere? Why?
12. Name the component of white light that deviates the least and the component that deviates the most while passing through a glass prism.
13. Why does the sky look blue on a clear day?
14. Why is red colour selected for danger signal lights?
15. Why does the sun appear reddish at sunrise?
16. What kind of lens is used in the spectacles of a person suffering from myopia?

## **SHORT ANSWER QUESTIONS IMPORTANT QUESTIONS**

1. What is the cause of short sightedness?
2. How is hypermetropia caused?
3. Explain the least distance of distinct vision.
4. How does the ciliary muscle of human eye help in normal functioning of the eye?
5. What is the cause of presbyopia? What type of lenses are used to correct presbyopia? Give reason.
6. When white light hits a prism surface, why does it split into constituent colours?
7. Name the defect of vision when:
  - (i) power of the eye is too great.
  - (ii) focal length of the eye lens is too great.
8. Name the defect of vision caused when:

- (i) cornea is not perfectly spherical.
  - (ii) power of accommodation of the eye decreases.
9. How does the eye regulate the light entering into it?
  10. By drawing a neat labelled diagram, show the course of a ray of light through an equilateral glass prism. Show clearly the angle of incidence and angle of deviation.
  11. What is stropsis as applied to human eyes? Explain.
  12. A mixture of yellow and blue light is passed through an equilateral prism. Draw a neat diagram when the light emerges out of the prism.
  13. Why is red light used as a universal danger signal?
  14. Why is the sunlight reaching the earth yellowish?
  15. Why does the smoke coming out of a coal fired chimney appear blue on a misty day?

## QUESTIONS FROM CBSE EXAMINATION PAPERS

1. Why does the clear sky appear blue? How would the sky appear in the absence of earth's atmosphere?
2. Why do we observe difference in colours of the Sun during sunrise, sunset and noon?
3. A person needs a lens of power  $-0.5$  dioptre 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 his
  - (i) distant vision
  - (ii) near vision?
4. Why does it take some time to see the objects in a dim room when we enter the room from bright sunlight outside?
5. Why does it take some time to see objects in a cinema hall when we just enter the hall from bright sunlight? Explain in brief.
6. (a) What is "power of accommodation of the eye"?  
(b) What happens to the image distance when the object being viewed is moved away from the eye?
7. (a) What is meant by least distance of distinct vision? (b) How does the thickness of the eye lens change when we shift looking from a distant tree to reading a book?
8. What is the scattering of light? Explain with the help of an example.
9. A star appears on the horizon. What is the true position of the star? Explain with the help of a diagram.
10. (a) Write the values of far point and near point of the human eye with normal vision.  
(b) What happens to the image distance from the eye lens in the normal eye when we increase the distance of an object from the eye?
11. Stars twinkle while the planets do not twinkle. Why?
12. A person can read the number plate of a distant bus clearly but he finds difficulty in reading a book. What type of defect of vision he is suffering from? Name the type of lens he needs to correct this defect. Write the causes of this defect.
13. Explain, why Sun appears white when it is over head at noon?

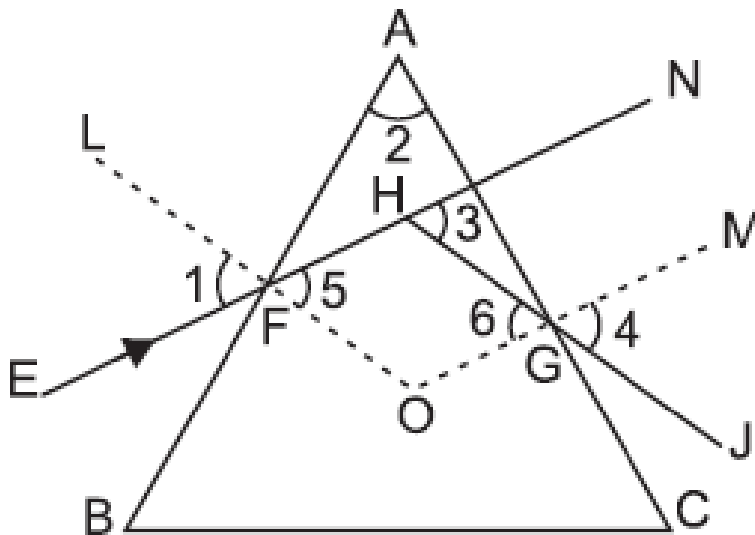
14. Why is normal eye not able to see clearly the objects kept closer than 25 cm? Explain in brief.
15. A person suffering from short - sightedness can see clearly up to a distance of 2 metres. Find the nature and power of the lens required to correct his vision.
16. A boy uses spectacles of focal length  $-60$  cm. Name the defect of vision he is suffering from. Which lens is used for the correction of this defect? Compute the power of this lens.
17. State in brief the functions of following parts of human eye:
- Iris
  - Cornea
  - Ciliary Muscles
  - Pupil
18. A student sitting at the back of a class is not able to see what is written on the blackboard. He however, sees it clearly when sitting on the front seat at an approximate distance of 1.5 m from the blackboard.
- Name the defect of the eye he is suffering from.
  - Draw ray diagram to illustrate the image formation of the blackboard writing by his eye lens when he is seated at the back seat.
19. What are the causes of the following defects of vision and how can they be corrected?
- Cataract
  - Presbyopia
20. A person needs a lens of power  $-2.0$  D for correcting his distant vision and lens of  $+1.5$  D to correct his near vision. What is the focal length of the lens required for correcting (i) distant vision (ii) near vision?
21. What is the cause of dispersion of white light passing through a prism? Which colour of light deviates the—
- most;
  - least
22. What is meant by dispersion of white light? Describe the formation of rainbow in the sky with the help of a diagram.
23. State the reason of the following observations recorded from the surface of the moon. (i) Sky appears dark
- (ii) Rainbow is never formed

## SHORT ANSWER QUESTIONS

### IMPORTANT QUESTIONS

- What happens to the image distance in the eye, when we increase the distance of an object from the eye?
- How is accommodation achieved by the human eye?
- (a) What is a rainbow? How is rainbow formed?  
(b) Which spectral colour is on :  
(i) the outer arc of rainbow,  
(ii) the innermost arc of rainbow?
- Why do the faces of person sitting in front of a camp fire appear to shimmer when seen from the opposite side?
- Why does the sun or moon appear bigger in size, when they are just going to rise or set?
- Why does the sun become visible during sunrise, when it is actually below the horizon?

7. What is vitreous humour? Where is it found in the eye ball? State two functions of vitreous humour.
8. What are the common defects of vision in the human eye? Give the cause and remedy for any three of them.
9. Draw a neat labelled diagram of the human eye.
10. The given diagram shows the path of a ray of light through an equilateral prism. Answer the following questions:

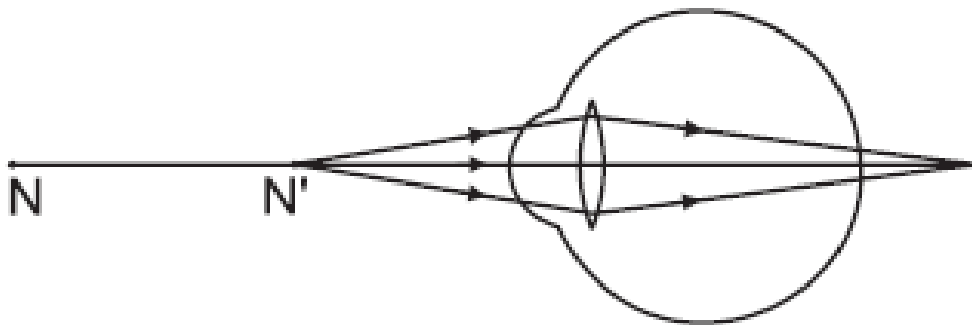


- (a) Which is the refracted ray?
  - (b) Which is the emergent ray?
  - (c) What name is given to angle 1?
  - (d) What name is given to angle 3?
  - (e) What name is given to angle 5?
  - (f) What is the relation between angles 1, 2, 3 and 4?
11. Draw ray diagrams each showing
    - (i) myopic eye and
    - (ii) hypermetropic eye.
  12. A student sitting at the back of the classroom cannot read clearly the letters written on the blackboard. What advice will a doctor give her? Draw a ray diagram for the correction of this defect.
  13. How are we able to see nearby and also distant objects clearly?
  14. A person needs a lens of power – 4.5 D for correction of her vision.
    - (a) What kind of defect in vision is she suffering from?
    - (b) What is the focal length of the corrective lens?
    - (c) What is the nature of the corrective lens?
  15. How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram.
  16. Draw a ray diagram showing the dispersion through a prism when a narrow beam of white light is incident on one of its refracting surfaces. Also indicate the order of the colours of the spectrum obtained. **[HOTS]**
  17. Is the position of a star as seen by us its true position? Justify your answer. **[HOTS]**
  18. Why do we see a rainbow in the sky only after rainfall?
  19. Why is the colour of the clear sky blue?

20. Why do motorists use orange lights, rather than normal white light on a foggy day?  
 21. Why do distant hills covered with trees appear blue?

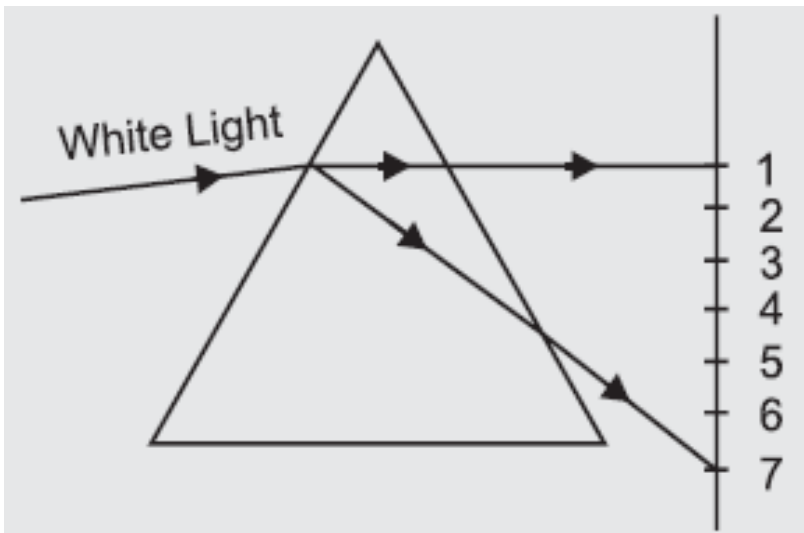
## QUESTIONS FROM CBSE EXAMINATION PAPERS

1. A person cannot see objects farther than 12 m from the eye clearly. Name the defect of vision he is suffering from and the lens that should be used for correction of this defect. Illustrate with the help of a diagram, how this lens will correct the defective vision.
2. A child is able to read his book comfortably but is unable to read the matter written on the blackboard at certain distance.
- Name the defect of vision he is suffering from
  - With the help of labelled ray diagrams Show
    - The above mentioned defect of vision
    - Correction of the above mentioned defect using a suitable lens.
3. (a) Define dispersion of light.  
 (b) Draw a ray diagram to show the path of a light ray that enters the glass prism obliquely. Label on it the angle of incidence and angle of deviation.
4. Study the diagram below and answer the following questions:



- Name the defect of vision depicted in the diagram.
  - List two causes of the above defect.
  - Draw a ray diagram for the correction of the above defect using an appropriate lens.
5. A person wears spectacles of power  $-2.5D$ . Name the defect of vision he is suffering from. Draw the ray diagram for
- the defective eye
  - its correction after using a suitable lens
6. A person cannot see objects nearer than 50 cm. He wants to read a book placed at a distance of 25 cm. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagrams for (i) the defective eye, (ii) its correction using a suitable corrective lens.
7. Draw ray diagrams to illustrate the image formed by
- normal eye,
  - hypermetropic eye and
  - correction of hypermetropia using a suitable lens.
8. A beam of white light falling on a glass prism gets split up into seven colours. A student makes the statement.
- (a) The colour at positions marked 1 and 3 are similar to the colour of 'turmeric' and the colour of 'Chilly powder' respectively. Is the above statement correct or incorrect? Justify.

- (b) Which two positions correspond to the colour of solution of copper sulphate and signal used to move the vehicles?
- (c) Light of colour of chilly powder bends the most while the light of colour of brinjal bends the least. Is the statement correct? Justify.



9. (a) Ravi kept a book at a distance of 10 cm from the eyes of his friend Hari. Hari is not able to read anything written on the book. Explain why?
- (b) A lens of focal length 50 cm is being used by a student in the laboratory as a magnifying glass. His least distance of distinct vision is 25 cm. What magnification is the student getting?
10. Give reasons for the following:
- Danger signals are red.
  - The sun can be seen about 2 minutes before actual sunrise.
  - We cannot see an object clearly if it is placed very close to the eyes.
11. Name the phenomenon associated with the following:
- The sky appear blue
  - Formation of a rainbow in the sky
  - Twinkling of stars
12. What is Presbyopia? Write two causes of this defect.
13. What is hypermetropia? State two causes of hypermetropia. With the help of ray diagrams, show:
- the eye-defect hypermetropia.
  - Correction of hypermetropia by using a lens.
14. What is hypermetropia? Draw ray diagrams to show the image formation of an object by :(i) Hypermetropic eye.  
(ii) Correction made with a suitable lens for hypermetropic eye.
15. (a) Draw a diagram to show the formation of image of a distant object by a myopic eye. How can such an eye defect be remedied?
- (b) State two reasons due to which this eye defect may be caused.
- (c) A person with a myopic eye cannot see objects beyond a distance of 1.5 m. What would be the power of the corrective lens used to restore proper vision?
16. Give reasons for the following:
- Colour of the clear sky is blue.
  - The sun can be seen about two minutes before actual sunrise.
  - We cannot see an object clearly if it is placed very close to the eyes.



## LONG ANSWER QUESTIONS

### IMPORTANT QUESTIONS

1. Explain the structure and functioning of the human eye. How are we able to see nearby as well as distant objects?
2. When do we consider a person to be myopic or hypermetropic? Explain using diagrams how the defects associated with myopic and hypermetropic eye can be corrected?
3. Explain the refraction of light through a triangular glass prism using a labelled ray diagram. Hence define the angle of deviation.
4. How can we explain the reddish appearance of sun at sunrise or sunset? Why does it not appear red at noon?
5. Explain the phenomenon of dispersion of white light through a glass prism, using a suitable ray diagram. **[HOTS]**
6. How does refraction take place in the atmosphere? Why do stars twinkle but not the planets? **[HOTS]**
7. Draw a neat diagram to show: (a) formation of spectrum by white light (b) recombination of spectral colours.
8. Draw a neat diagram to show refraction of light through an equilateral glass prism. On the diagram clearly show:
  - (i) angle of incidence
  - (ii) angle of refraction,
  - (iii) angle of deviation
  - (iv) angle of the prism.

## QUESTIONS FROM CBSE EXAMINATION PAPERS

1. A person cannot see the objects distinctly, when placed at a distance less than 50 cm.
  - (a) Identify the defect of vision.
  - (b) Give two reasons for this defect.
  - (c) Calculate the power and nature of the lens he should be using to see clearly the object placed at a distance of 25 cm from his eyes.
  - (d) Draw the ray diagrams for the defective and the corrected eye.
2. A person cannot see the objects distinctly, when placed beyond 2 m.
  - (a) Identify the eye defect.
  - (b) Give two reasons for this defect.
  - (c) Calculate the power and nature of the lens he should be using to see the distant objects clearly.
  - (d) Draw the ray diagrams for the defective and the correct eye.
3. (a) What is Myopia? State two causes of Myopia. With the help of a labelled ray diagram show the correction of Myopia using appropriate lens.
  - (b) The near point of a hypermetropic eye is 1m. Find the power of the lens required to correct this defect. Assume that near point of the normal eye is 25 cm.
4. (a) What is hypermetropia? State two causes of hypermetropia. Draw a labelled ray diagram to show how this defect may be corrected using spectacles of appropriate focal length.
  - (b) The near point of a hypermetropic eye is 1.0 m. Find the power of the lens required to correct this defect. The least distance of distinct vision for a normal eye is 25 cm.

