

JANUARY 2012

# CLASS - X PHYSICS

## HUMAN EYE (G-S-S)

### <<< IMPORTANT QUESTIONS >>>

2. What is the role of retina ?
3. Name the cells that respond to intensity of light.
4. Which cell is responsible for colour perception ?
5. What is the main function of ciliary muscles ?
6. What is Accommodation ?
7. What is the value of least distance of distinct vision for a young adult with normal vision ?
8. Give the role of iris.
9. What is Pupil ?
10. What do you mean by "near point" ?
11. What is the meaning of "far point" of eye ?
12. How many frames per second are to be projected for clear view of motion pictures ?
13. How long does the light from an event stay in our eye ?
14. When do we say a person is colour-blind ?
15. Name the colours that affect the cone cells.
16. What is cataract ?
17. Is it possible to correct the problem of cataract ?
18. Name the four common defects of vision.
19. What is Myopia ?
20. What is the problem in Hypermetropia ?
21. How will you correct myopic eye ?
22. What is the remedy for Hypermetropic eye ?
23. How can you overcome Presbyopia ?
24. Where do we use cylindrical lenses ?
25. What is a contact lens ?
26. Where do we see (i) Concave and (ii) Convex lens in bi-focal lenses ?
27. How can we extend the range of vision of eye ?
28. Where does our eye form the image of an object ?

29. Write the nature of image formed by our eye.
30. What is the principle used in cinematography ?
31. Name the eye defect that can be rectified by using a bi-focal lens.
32. When do you have the least strain on the muscles of a normal eye ? (Give the focussing point)
33. A man wearing glasses of focal length +1 m cannot see objects clearly beyond 1 m. What is the defect in the eye ?
34. What is the focal length of normal eye lens ?
35. What is the approximate wavelength range for the visible spectrum ?
36. Write the condition needed for total internal reflection to take place.
37. What is critical angle of incidence ?
38. What is dispersion ?
39. What is a Mirage ?
40. What do you mean by looming ?
41. Define Dispersion.
42. What does the acronym VIBGYOR refer to ?
43. Name the three primary colours.
44. When two prisms, one up and one down in contact, receives white light, what colour of light will emerge out ?
45. A child can read his book easily but unable to read the matter written on the blackboard. Name the defect of eye from which he is suffering.
46. Many people at the old age, find difficulty to read comfortably and distinctly without the corrective spectacles. From which defect of eye they are suffering ?

### <<< NCERT QUESTIONS >>>

47. What is meant by power of accommodation of the eye ?
48. A person with myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision ?
49. The human eye forms the image of an object at its
  - (a) cornea
  - (b) iris
  - (c) pupil
  - (d) retina
50. The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to :
  - (a) change in the refractive index of the eye lens
  - (b) change in the curvature of the eye lens
  - (c) change in the size of the eye lens
  - (d) change in the position of the eye lens
51. 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
52. 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
53. What happens to the image distance in the eye when we increase the distance of an object from the eye ?

### <<< PREVIOUS YEARS' QUESTIONS >>>

1. Describe 'total internal reflection of light'. What is the essential condition for its occurrence ? [Foreign 2006]
2. What is meant by 'critical angle' for a ray of light going from a denser to a rarer medium ? What will be the consequence, if the angle of incidence, at the interface is greater than the critical angle ? [Delhi 2005C]
3. A ray of light undergoes total internal reflection while moving from a denser to a rarer medium. Derive the relation connecting critical angle and refractive indices of the two media. [Foreign 2001]
4. State the reason for the following observations recorded from the surface of moon.
  - (i) Sky appears dark
  - (ii) Rainbow is never formed. [AI 2000]
5. Write two essential conditions for total internal reflection to take place in a transparent medium. Give two examples of this phenomenon in daily life situations. [Foreign 1998]

### <<< IMPORTANT QUESTIONS >>>

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 enable him to see very distant objects distinctly ?
7. Why does it take some time to see objects in dim light when you enter the room from bright sunlight outside ?
8. How is the amount of light entering the eye controlled ? What change is made in the eye to enable it to focus on object situated at different distances ?
9. What is short-sightedness and long-sightedness ? How can these defects be corrected ?
10. Explain the least distance of distinct vision.
11. How does ciliary muscle of human eye help in the normal functioning of the eye ?
12. How does a normal eye see distant objects clearly ?
13. Draw ray diagram to show a myopic eye. Suggest a remedy for the same.
14. Draw ray diagram to show a hypermetropic eye. Give a way to rectify the same.
15. What is the cause for short-sightedness ?
16. Why do we get Hypermetropia ?
17. What is Presbyopia ? How will you correct the same ?
18. What is Astigmatism ? How will you correct it ?

(Physics) - X

The Human Eye and the Colourful World

## Short Answer Type Questions

### PREVIOUS YEARS' QUESTIONS

- Name any one common defect of vision and the type of lens used to remove it.
- If an eye has near point at distance of 0.5 m, what is the power of lens required to correct it?
- If the far point of eye lens is 10 metre, find the power required to correct the defect.
- Calculate the magnification of a glass of focal length 5 cm, when the image is formed at the distance of distinct vision.
- Write the role played by
  - iris and
  - retina.
- What are Rods and Cones?
- Write about the importance of ciliary muscles.
- Define the terms :
  - near point
  - far point.
- Why do we project 24 images per second for a clear view of motion picture?
- Define the power of accommodation. What is its value for a young adult with normal vision?
- Explain the special character of light sensitive cells in chicks.
- What is the frequency range to which bees are sensitive? How is it possible?
- What is cataract? How do we rectify the same?
- What is the cause for Myopia?
- What causes Hypermetropia?
- What type of lenses are used to correct presbyopia? Give reason.
- What is the cause for Presbyopia? How the lenses are placed to correct it?

### NCERT QUESTIONS

- 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?
- Why do stars twinkle?
- Why does the sky appear dark instead of blue to an astronaut?
- What is the far point and near point of the human eye with normal vision?

### Science (Physics) - X

- With the help of ray diagram show the phenomenon of total internal reflection of light and the concept of critical angle for a transparent medium. [Delhi 2004]
- What do you understand by the phenomenon of T.I.R.? Give two conditions for it to take place.
- The near point of a hypermetropic person is 75 cm from the eye. What is the power of the lens required to enable him to read clearly a book held at 25 cm from the eye?
- If the person, in the previous problem, uses spectacles of power + 1.0 dioptre, what is the nearest distance of distinct vision for him?
- What is accommodation? Explain how does the ciliary muscle do help in accommodation.
- What is persistence of vision? How do we make a motion picture possible?
- How do we see colours? Explain the role of cells to control
  - intensity
  - colour.
- What are the common defects of vision in human eye? Give the cause and remedy for any three of them.
- What is the meaning of
  - Presbyopia?
  - Astigmatism?
- Give the cause and remedy for them.
- Draw a neat labelled diagram of human eye.

### NCERT QUESTIONS

- 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
  - distant vision
  - near vision?

- Derive the relation connecting refractive index and critical angle for a given pair of media. [AI 2001; Delhi 2000]
- What are optical fibres? Give three applications of these fibres. [Delhi & Hr 1999]

### IMPORTANT QUESTIONS

- Explain the role played by
  - iris,
  - pupil,
  - cornea,
  - retina,
  - ciliary muscles,
  - aqueous humour.
- What is total internal reflection? Write the conditions under which T.I.R. takes place.
- What is the critical angle for T.I.R. from a glass surface, if the light moves from
  - glass to air and
  - glass to water?
- Explain with reason why stars appear to twinkle.
- What is dispersion? Which colour deviates the most in a prism? Why does it take place?
- When can we make a white light to emerge out as white light from an arrangement of prisms?
- You are given four lenses namely, bi-focal lens, convex lens, concave lens and cylindrical lens. Which lens would you prefer to correct the myopia, hypermetropia, astigmatism and presbyopia respectively?
- The near point of a hypermetropic person is 75 cm if the person uses eyeglasses having power +1.0 D, calculate the distance of distinct vision for him.

### The Human Eye and the Colourful World

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

# CLASS - X PHYSICS

## LIGHT - REFLECTION AND

## REFRACTION (G.S.S)

### Short Answer Type Questions (D. III)

#### << PREVIOUS YEARS' QUESTIONS >>

1. Draw a ray diagram to show the (i) position and (ii) nature of the image formed when an object is placed between focus F and pole P of a concave mirror. [Delhi 2006]
2. An object is placed at a distance of 12 cm in front of a concave mirror. It forms a real image four times larger than the object. Calculate the distance of the image from the mirror. [AI 2006]
3. With respect to air, the refractive index of ice is 1.31 and that of rock salt is 1.54. Calculate the refractive index of rock salt with respect to ice. [Delhi 2005]
4. Light enters from air into glass plate which has a refractive index of 1.50. Calculate the speed of light in glass. The speed of light in air is  $3 \times 10^8 \text{ ms}^{-1}$ . [AI 2005]
5. In what S.I. units is power of lenses rated? A convex lens has a focal length of 50 cm. Calculate its power. [Foreign 2005]
6. A convex lens has a focal length of 40 cm. Calculate its power. [Foreign 2005]

#### << IMPORTANT QUESTIONS >>

12. A ray of light while travelling from a denser to a rarer medium undergoes total internal reflection. Derive the expression for the critical angle in terms of the speed of light in the respective media.
13. How do optical fibres transmit light without absorption? Mention one practical application of optical fibres.
14. If you are driving a car, what type of mirror would you prefer to use for observing traffic at your back and why?
15. Light of wavelength 500 nm in air, enters a glass plate of refractive index 1.5. Find (i) speed (ii) frequency and (iii) wavelength of light in glass. Assume that the frequency of light remains the same in both media. [Ans.  $2 \times 10^8 \text{ ms}^{-1}$ ,  $4 \times 10^{14} \text{ Hz}$ , 333 nm]

Science (Physics) - X

Light - Reflection and Refraction

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16. Two thin lenses of power +3.5 D and -2.5 D are placed in contact. Find the power and focal length of the lens combination. [Ans. 100 cm]
17. Given the refractive index of water and glass is 4/3 and 3/2 respectively. Write the relation and find the value of refractive index of water with respect to glass and glass with respect to water. [Ans.  $\frac{8}{9}$  and  $\frac{9}{8}$ ]
18. A convex mirror used on an automobile has a focal length of 3.00 m. If a vehicle behind is at a distance of 5.00 m, find the location of the image? [Ans. 1.9 m, virtual]
19. Magnification of a plane mirror is  $m = +1$ . What does  $m = 1$  and positive sign signify?
20. Distinguish between a real and virtual image.
21. State the basic laws of reflection.
22. Write the nature of image formed by a plane mirror.
23. What is the distance between the image and the plane mirror, if the object is at 15 m?
24. How do we locate the position of image? Show with an example.
25. Why does a ray falling normally on a plane mirror, retrace its path?
26. We have to form an erect image of an object placed in front of a concave mirror of focal length 15 cm. Draw the ray diagram.
27. Why are we advised not to see sun directly?
28. Distinguish between a convex and concave mirror.
29. Write the mirror formula. How do we use the same?
30. Define magnification. Give the general formula and sign convention used for a spherical mirror.
31. By sign convention give the sign of concave and convex mirror's focal length and radius of curvature.
32. Prove that  $R = 2f$  for a concave or a convex mirror.
33. A concave mirror of focal length 1.5 m forms a real image of an object at a distance of 40 cm. Find the position of the image. [Ans.  $v = +0.55 \text{ m}$ ]
34. How can we find the (rough) focal length of a concave mirror?
35. Define Refractive index.
36. State the two laws of refraction.
37. What is Refraction? Why does a light bend on refraction?
38. How does a light ray bend when it travels from (i) a denser to a rarer medium (ii) a rarer to a denser medium?
39. How do we distinguish a medium to be rarer or denser? Give two reasons.
40. Write refractive index in two different forms.
41. Is denser or rarer nature relative or absolute? Arrange the following media in the order of increasing denser nature. Given the refractive index of air, glass, kerosene, diamond are 1, 1.5, 1.44, and 2.42 respectively.
42. Give two characteristics of light refracted through a glass slab.
43. When a convex lens is focussed on a distant object, where will the image be formed? Show it with a ray diagram.
44. What is the nature of image formed by a convex lens when the object is between the focus and optical centre? Draw a ray diagram for the same.
45. What is the meaning of (i) optical centre and (ii) principal focus?
46. When we focus sunlight using a convex lens at the tip of a matchstick, what will happen? Why?
47. Show by the use of a ray diagram, that a concave lens always diverges light.
48. Write the lens formula and the sign convention used.
49. When does a convex lens form (i) a virtual, erect, enlarged image (ii) real, enlarged image?
50. What is the meaning of power of a lens? What is its S.I. unit?
51. When two lenses of focal length +10 cm and -5 cm are placed in contact, find the net power.
52. How is power related to focal length? Find the power of a concave lens of focal length 50 cm.
53. Why do we say  $n_{21} = 1/n_{12}$  for a pair of media?
54. Light coming from the bottom of a water tank does not come out of the water. What should be the minimum angle of incidence for the same?

55. Whatever may be the position of object, the image appears to be erect. Give the nature of mirror with reason.
56. An object is placed at a distance of 25 cm from the pole of a spherical mirror which forms a real, inverted image on the same side of object at 37.5 cm from the pole. Calculate the focal length of mirror and find nature of the mirror.

### ◀◀ NCERT QUESTIONS ▶▶

58. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?
59. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is  $3 \times 10^8$  m/s.

### Short Answer Type Questions (SA-I)

#### ◀◀ PREVIOUS YEARS' QUESTIONS ▶▶

1. A concave lens has focal length of 20 cm. At what distance from the lens a 5 cm tall object be placed so that it forms an image at 15 cm from the lens? Also calculate the size of the image formed. [Delhi 2007]
2. An object 30 cm tall is placed on the principal axis of a convex lens. Its 20 cm tall image is formed on the screen placed at a distance of 10 cm from the lens. Calculate the focal length of the lens. [AI 2007]
3. An object 20 cm tall is placed on the principal axis of a convex lens. Its 30 cm tall image is formed on the screen placed at a distance of 10 cm from the lens. Calculate the focal length of the lens. [AI 2007]
4. An object 30 cm tall is placed on the principal axis of a convex lens. Its 10 cm tall inverted image is formed on the screen placed at a distance of 15 cm from the lens. Calculate the focal length of the lens. [AI 2007]
5. A 5.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. By calculation determine (i) the position and (ii) the size of the image formed. [Delhi & AI 2006]

10. A convex lens has a focal length of 30 cm. Calculate at what distance should the object be placed from the lens so that it forms an image at 60 cm on the other side of the lens. Find the magnification produced by the lens in this case. [Delhi 2004]

11. (i) Draw a ray diagram to show passage of two rays of light through a rectangular slab of glass, when the angle of incidence is zero in one case and a little less than  $90^\circ$  in other case.  
(ii) Prove that if a ray enters a rectangular glass slab obliquely and emerges from the opposite face, the emergent ray will be parallel to the incident ray. [Foreign 2004]
12. (i) State Snell's law of refraction of light.  
(ii) A transparent medium A floats on another transparent medium B. When a ray of light travels obliquely from A into B, the reflected ray bends away from the normal. Which of the two media A and B is optically denser and why?

13. The radius of curvature of a convex mirror used on a moving automobile is 2.0 m. A truck is coming behind it at a constant distance of 3.5 m. Calculate (i) the position and (ii) the size of image relative to the size of truck. What will be the nature of image? [Foreign 2004]
14. An object 3 cm high is placed at a distance of 9 cm in front of a concave mirror of focal length 18 cm. Find the position, nature and size of the image formed. [Delhi & AI 2004C]
15. An object 3 cm high is placed at a distance of 20 cm in front of a convex lens of focal length 12 cm. Find the position, nature and size of the image formed. [Delhi & AI 2004C]
16. Find the position, nature and size of the image of an object 3 cm high placed at a distance of 6 cm from a concave mirror of focal length 12 cm. [AI 2004C]

#### ◀◀ IMPORTANT QUESTIONS ▶▶

27. An object placed 45 cm from a lens forms an image on a screen placed 90 cm on the other side of the lens. Identify the type of the lens and find its focal length.

17. Where should an object be placed from a converging lens of focal length 20 cm, so as to obtain a real image of magnification 2? [AI 2001]

18. Find the position of the object which when placed in front of a convex mirror produces a virtual image, which is half the size of the object. [Delhi 1999]

19. Find the position of an object which when placed in front of a concave mirror of focal length 20 cm produces a virtual image, which is twice the size of the object. [Delhi 1999]

20. Velocity of light in glass is  $2 \times 10^8$  ms<sup>-1</sup> and in air is  $3 \times 10^8$  ms<sup>-1</sup>. If the ray passes through glass to air, calculate the value of critical angle. [Pb 1999]

21. Draw a ray diagram to show the image formed of an object placed between  $f$  and  $2f$  distances from a convex lens. Deduce the relation between the object and image distance from the lens and the focal length under this condition. [AI 1998]

22. Draw a ray diagram to show the image of an object placed between  $f$  and  $2f$  of a thin concave lens. Deduce the relation between the object and image distance and focal length. [AI 1998]

23. An object is kept in front of a concave mirror of focal length 15 cm. The image formed is three times the size of object. Calculate two possible distances of the object from the mirror. [AI 1998]

24. Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected (b) refracted light? ( $n$  of water = 1.33) [Delhi 1997]

25. Establish the relation between object distance, image distance and radius of curvature for a convex mirror. [AI 1997]

26. An object 10 cm long is placed at 15 cm away from a convex lens of focal length 10 cm. Find the position and size of image. [JK 1997]

28. State the laws of reflection. Using a plane mirror, how will you prove them.