

QUESTION BANK
SCIENCE
STD-X

PHYSICS

REFLECTION & REFRACTION OF LIGHT
(REVISION QUESTIONS)

VERY SHORT ANSWER TYPE (1 MARK)

1. Out of red and blue lights, for which is the refractive index of glass greater?
2. What happens to the velocity of light, its wavelength and frequency, when it passes from one medium into another?
3. If the radius of curvature of a concave mirror is 40cm, what is its focal length?
4. In which medium, speed of light is the highest?
5. What is the angle of reflection when the incident ray strikes the reflecting surface of a plane mirror normally?
6. How is the focal length related to the radius of curvature of a spherical mirror?
7. How do you draw the normal at the point of incidence in case of a spherical mirror?
8. What is meant by the linear aperture of a spherical mirror?
9. How will you distinguish between a plane mirror, a concave mirror and a convex mirror without touching them?
10. What is the position of an object with respect to a concave mirror, for which the image formed, is virtual and enlarged?
11. Mention the important applications or use of a concave mirror.
12. What is the type of mirror used in automobiles and why?
13. Write the two laws of reflection of light?
14. Draw the image of a body in three coordinate axes framed by a plane mirror?
15. In what direction does a ray of light bend while traveling in a rarer medium falls on the surface of a denser medium

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17. Which law is known as Snell's law?
18. Define refractive index of a medium.
19. In which direction does a ray of light bend while going from water to glass?
20. A ray of light traveling in air enters a rectangular glass slab through its one face and emerges out of it through its opposite parallel face. In which direction does the emergent ray bend with respect to the incident ray ?
21. Refractive index of water with respect to air is $\frac{4}{3}$. What is the refractive index of air with respect to water?
22. What does the bottom of a swimming pool or tank of water appear to be raised?
23. A pencil is dipped in water contained in a glass beaker. The pencil is dipped in water making an angle with its free surface. The pencil appears broken just at the point where the water surface touches it. Why?
24. What do you understand by lateral shift in the case of refraction of light through a rectangular slab?
25. Does lateral shift 'd' depend upon the thickness of the medium (i.e. the thickness of the rectangular slab)? Give reason.
26. A convex lens has focal length of 20cm. Find its power.
27. What is the point inside the lens through which light passes undeviated ?
28. An object 2cm high is placed at a distance of $2f$ from a convex lens. What is the position of image formed? What is the size and nature of the image?
29. An object is placed between the optical centre and focus of a convex lens? What is the nature of the image formed ?
30. If the image formed by a lens is always diminished and erect, what is the type of the lens?
31. If the power of a lens is +2.0 dioptres, what is the focal length and the nature of the lens?
32. A lens has the power equal to -4D. What is the focal length and nature of the lens?

33. Name the most important optical instrument available in human body.
34. How is the power of accommodation exercised by the eye?
35. What is the value of least distance of distinct vision for normal eye?
36. What is the cause of presbyopia?
37. What is the far point for normal eye? Where does it lie?
38. How do you distinguish between dispersion and spectrum?
39. During the phenomenon of dispersion of white light through a glass prism, which colour is deviated the most and which one is deviated the least?
40. Sunlight after passing through a red glass plate falls on a blue flower. What will the colour of the flower?
41. How would a red rose appear in a blue light?
42. Define sign convention.
43. What is the focal length of a plane mirror of size 5cm. x 5 cm?
44. A body of size 5cm has magnification 2. What is the size of the image?
45. Speed of light in vacuum is 3×10^8 m/s. Find the speed in a medium of refractive index 1.25.
46. If ${}_a\mu_g = 3/2$, find ${}_a\mu_g$
47. If ${}_a\mu_w = 4/3$ find ${}_w\mu_a$
48. If ${}_a\mu_g = 3/2$ and ${}_a\mu_w = 4/3$ find ${}_w\mu_g$
49. Explain why there is no refraction with normal incidence.
50. What is the power of a glass slab?
51. A denser medium has refractive index 1.5. Calculate critical angle for it.
52. A denser medium has critical angle 60° . Calculate its refractive index.

SHORT ANSWER TYPE (2 MARKS)

1. The far point of a myopic person is 150 cm in front of the eye, Calculate the focal length and the power of a lens required to enable him to see distant objects clearly?

2. A concave and convex mirror is to be used to get a diminished image of an object. How should the object be positioned in the two cases? What difference if any, would be there between the images in the two cases?
3. The apparent depth of water in a swimming pool is 4.2 m. What is the actual depth, if the refractive index of water is 1.33?
4. What is the apparent depth of water in a pool if the real depth is 5m? The refractive index of water is 1.33.
5. A man stands in front of a plane mirror. What is the distance moved by the image of the man if
 - i. The mirror is moved 75cm away from the man?
 - ii. The man moves 75 cm away from the mirror?
6. A man stands 2m in front of a plane mirror. The mirror is moved 1 m towards the man while the man moves 50cm away from the mirror. What is the distance moved by the images of the man?
7. Two mirrors are placed at right angles to each other. A ray of light strikes one mirror at an angle of incidence such that it gets reflected by the second mirror also. Show that for any value of q , the ray reflected from the second mirror will be parallel to the ray incident on the first mirror, but with its direction reversed.
8. Two plane mirrors are inclined at 45° . A ray of light reflected by one mirror falls on the second mirror and is reflected by it. Find the total deviation of the ray.
9. A man, 1.8m tall, stands before a plane mirror. What should be the minimum height of the mirror so that he can see his image from head to toe ? Assume that the level of the eye represents his height.
10. Write expressions for the focal length and power of a lens combination.
11. A 2cm high object is placed at a distance of $2f$ from a convex lens. What is the position and height of the image formed?
12. An object is placed at a distance of 10cm from a convex lens of focal length 30cm. Find the position and nature of the image.
13. An object is placed at a distance of 4 cm from a concave lens of focal length 12cm. Find the position and the nature of the image.

14. A ray of light is incident on a glass slab at the angle of incidence i . Let the angle of refraction be r . If $i + r = 90^\circ$, show that $\tan i = {}_a n_g$.
15. Prove that, the reflected ray is rotated through twice the angle through which the mirror itself is rotated ?
16. Draw the images formed by two plane parallel mirrors ?
17. A thin lens has a focal length of -25cm. What is the power of the lens and what is its nature ?
18. A concave lens of focal length 15cm forms an image at a distance of 10cm from the lens ? Show that the object is placed 30cm away from the lens.
19. An object is placed 10cm from a concave lens of focal length 6 cm. Find the position of the image. Draw the corresponding ray diagram.
20. How is myopia caused ?
21. How is hypermetropia caused ?
22. How is astigmatism caused ? What is the type of lens used for its correction ?
23. Describe in brief an experiment to show that white light consists of seven different colours.
24. A concave mirror produces four times magnified real image of an object placed at 10cm. in front of it. Where is the image located ?
25. Describe the nature of the image formed when the object is placed at a distance of 30cm. from a concave mirror of focal length 15cm.
26. An object is placed at a distance of 10cm. from a convex mirror of focal length 20cm. Find the position and nature of the image.
27. A coin at the bottom of water tank appears to be 4m below the water surface. What is the depth of water in the tank ? The refractive index of water = 1.33.

SHORT ANSWER TYPE (3 MARKS)

1. Draw a ray diagram to show why a distant object is not seen by a myopic eye and how this defect is corrected.
2. Draw a ray diagram to show why a near object is not seen by a hypermetropic eye and how this defect is corrected.

3. An object 1 cm in height is placed at a distance of 0.80m from a double convex lens of focal length 0.2m. Find the location and size of the image formed by (a) calculation and (b) the graphical method.
4. An object is placed 36 cm in front of a diverging lens of focal length 24cm. Find the location and magnification of the image formed by (a) calculation and (b) the graphical method.
5. A object 60cm from a lens has its virtual image at a distance of 20 cm in front of the lens. What is the focal length of the lens ? Is the lens converging or diverging ?
6. An object 2.5 cm high is placed 6.0 cm from a converging lens with a focal length of 4.0cm. Determine (a) the image distance, (b) the image size and (c) the magnification.
7. An object and its real image are at distances 25cm and 40cm, respectively, from the two principal foci of a lens. Find the focal length of the lens and the magnification of the image formed.
8. An object and a screen are fixed 80 cm apart. In one position, for a convex lens a real image is formed on the screen with a magnification of $\frac{2}{3}$. Find the focal length of the lens.
9. Where must an object 2 cm tall be placed in front of a concave mirror of radius of curvature 20cm, if an erect image 4cm tall is to be obtained ?
10. Where must an object 2cm tall be placed in front of a concave mirror of radius of curvature 30cm, if a real image 4cm tall is to be obtained ?
11. An object 3cm high is placed 15cm in front of a convex mirror. If the image distance is 5cm, calculate the focal length of the mirror. Find the height of the image.
12. A lamp is 4.0m from a wall. Find the focal length of a concave mirror which will form a five times magnified image of the lamp on the wall. How far from the wall must the mirror be placed ?
13. The radius of curvature of a concave mirror used by a dentist is 30 cm. How far from the teeth of a patient must the mirror be placed to give a virtual image which is magnified five times ?

14. When an object is placed at distance of 30 cm from a convex mirror, the image distance is 10cm. If the object is moved with a speed of 9 cm s^{-1} , find the speed with which the image moves.
15. A spherical mirror forms images of the same size when an object is placed at a distance of 8 cm or 16cm from the mirror. Find the radius of curvature of the mirror. Is the mirror concave or convex ?
16. A concave shaving mirror of radius of curvature 32 cm is placed in such a way that the image is 2.8 times the size of the face. Find the distance of the mirror from the face.
17. What can you infer about the nature of the image when the value for the magnification is (a) positive (b) negative
18. What is the position of the object when a concave mirror.
 - a) Forms an image which is of the same size as the object?
 - b) Forms a magnified real image ?
 - c) Forms a magnified virtual image ?
19. State three rules regarding the tracing of a ray of light being reflected by a concave mirror.
20. State three rules regarding the tracing of a ray of light being reflected by a convex mirror.
21. An object placed 10cm. in front of a lens produces a real image four times magnified. Find the position of the image and the focal length of the lens.
22. An object is held 25 cm away from a converging lens of focal length 10cm. Find the position and nature of the image.
23. placed 60cm from a lens produces a virtual image at a distance of 12cm in front of the lens. Calculate the focal length of the lens and give its nature.
24. An object 6cm high is held 30cm away from a converging lens of focal length $f=10\text{cm}$. Find the position and size of the image formed. Is the image real or virtual ?
25. An object is placed at a distance of 45cm from a concave lens of focal length 15cm. Find the nature and position of the image.

26. A candle is held 3 cm from the pole of a concave mirror whose radius of curvature is 24 cm. Where is the image formed ? What is the nature of the image?
27. A dentist uses a concave mirror of focal length 3 cm and holds it at a distance of 2 cm. from the teeth. What is the magnification of the image formed ?
28. An object 2.5 cm high is placed at right angles to the principal axis of a concave mirror. The distance of the object from the mirror is 25cm. The object is placed to the left of the mirror and its image is formed on the same side at a distance of 50cm from the mirror. What is the height of the image formed ?
29. A convex mirror used in an automobile has 3.0m radius of curvature. If a bus is located at a distance of 5.0m from the mirror, find the position, size and nature of the image formed.
30. A glass slab is 6cm x 3cm x 12 cm in size. It can be placed on a line drawn on a write paper with any of the three dimensions vertical. How much does the line appear to be raised up in each case when seen through glass ? Refractive index of glass is 1.5
31. To a boy of height 1.5m, a tank of water appears 1.2m deep when seen from outside. Suggest whether it is advisable for him to get down into the tank if he does not know swimming. Given $n_w = 1.33$.
32. A 10 cm tall image of an object is projected on a screen 50 cm from a convex lens of focal length 10cm. Find the position and size of the object.
33. An object 60cm from a lens has its virtual image at a distance of 20cm in front of the lens. What is the focal length of the lens ? Is the lens converging or diverging ?
34. A concave lens of focal length 15cm forms an image 10cm from the lens. How far is the object placed from the lens ? Draw ray diagram.
35. A concave lens has focal length of 15cm. At what distance should the object from the lens be placed so that it forms an image at 10cm from the lens ? Also find the magnification of the image.
36. The far point distance of a short sighted person is 1.5 m. Find the focal length, power and nature of the remedial lens.

37. Near point of a hypermetropic eye is at 1 m. Find the focal length, power and the nature of lens used to correct the defect.
38. How is myopia corrected? What type of lens is used for this purpose ?
39. How is hypermetropia remedied ? What type of lens is used for this purpose?
40. Describe how a spherical mirror formula is applicable to a plane mirror.
41. Where should an object be placed in front of a convex mirror of focal length 10cm. to get an image 5cm. behind the mirror ?
42. An object 4cm. high is placed at a distance of 20cm. from a concave mirror which produces a real image 5cm. high.
 - a) Find the position of the image.
 - b) What is the focal length of the mirror ?
43. An object placed 30cm. in front of a mirror is found to have an image 20cm. (a) in front of (b) behind it. Find the focal length of the mirror and its kind in each case.
44. An object is placed at distance of 6cm. from a convex mirror of focal length 12cm. Find the position and nature of the image.
45. By drawing a diagram to scale, determine the position, size and nature of the image formed when an object 5 cm tall is placed 20 cm in front of a concave mirror of focal length 15cm.
46. The distance between a concave mirror and the screen is 5m. An object of height 1 cm is placed between the mirror and the screen on which an image of height 5cm is formed. Calculate (a) the focal length, (b) the radius of curvature of the mirror and (c) the position of the object.
47. Draw a ray diagram to show the image formed when an object is placed a little beyond the centre of curvature of a concave mirror. Describe the characteristics of the image formed.
48. Draw a ray diagram to show the image formed when an object is placed between F and C of a concave mirror. Describe the characteristics of the image formed.

49. Draw a ray diagram to show the image formed when an object is placed between a concave mirror and its focus. Describe the characteristics of the image formed.
50. An object 3cm in height is located at a distance of 10cm from a concave mirror of focal length 10cm from a concave mirror of radius of curvature 40cm. Calculate the position, size and nature of the image.
51. The distance between a concave mirror and the screen is 6cm. An object of height 1 cm is placed between the mirror and the screen, on which an image of height 4cm is formed. Calculate (a) the focal length, (b) the radius of curvature of the mirror and (c) the position of the object.
52. A concave mirror is being used as a shaving mirror. The mirror is placed 45 cm in front of the face. If the desired lateral magnification is 3, what should be the radius of curvature of the mirror ? What is the nature of the image ?
53. The focal length of a concave mirror is 30 cm. Where should an object be placed so that it produces (a) a real image and (b) a virtual image, each with a lateral magnification of 2 ?
54. An object 5cm tall is placed 20cm from a spherical mirror. A virtual, enlarged image 10cm tall is formed. Calculate the focal length of the mirror and the position of the image. What type of mirror is used ?
55. 55. We see the Sun before it comes above the horizon. Explain.

LONG ANSWER TYPE (5 MARKS)

1. Define different terms associated with reflection of light from spherical mirror.
2. Define and explain sign convention.
3. Define and explain linear magnification.
4. Describe image formation by a concave mirror in different cases.
5. Where would you place an object in front of a concave mirror to produce.
 - a) A real, magnified image
 - b) An image of the same size as the object.
 - c) A real, diminished image
 - d) An erect, magnified image.