PRACTICE PAPER (2026–27)

Chapter 09: Light – Reflection and Refraction

CLASS: X **SUBJECT: SCIENCE** **DURATION: 1½ hrs** **MAX. MARKS: 40**

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five Sections: **A**, **B**, **C**, **D**, and **E**.
3. **Section A** comprises 10 Multiple Choice Questions (including Assertion-Reason) of 1 mark each.
4. **Section B** comprises 4 questions of 2 marks each.
5. **Section C** comprises 3 questions of 3 marks each.
6. **Section D** comprises 1 question of 5 marks (with internal choice).
7. **Section E** comprises 2 Case Study Based Questions of 4 marks each.
8. Use of calculators is strictly prohibited.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. An object is placed at a distance of 10 cm in front of a convex mirror of focal length 15 cm. The image formed is:
   (a) Real, inverted, and enlarged
   (b) Virtual, erect, and magnified
   (c) Real, inverted, and diminished
   (d) Virtual, erect, and diminished

2. The refractive index of water is 4/3 and that of glass is 3/2. The refractive index of glass with respect to water is:
   (a) 8/9
   (b) 9/8
   (c) 2
   (d) 1/2

3. A concave mirror produces a magnification of −1 on a screen placed at a distance of 40 cm from the mirror. The focal length of the mirror is:
   (a) −40 cm
   (b) −20 cm
   (c) −10 cm
   (d) +20 cm

4. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?
   (a) A convex lens of focal length 50 cm
   (b) A concave lens of focal length 50 cm
   (c) A convex lens of focal length 5 cm
   (d) A concave lens of focal length 5 cm

5. A ray of light travels from medium A to medium B. If the speed of light in medium A is 2.5×10^8 m/s and in medium B is 2.0×10^8 m/s, the ray will:
   (a) Bend towards the normal
   (b) Bend away from the normal
   (c) Pass undeviated
   (d) Reflect totally back into medium A

6. The power of a combination of two lenses in contact having focal lengths +20 cm and −50 cm is:
   (a) +3.0 D
   (b) −3.0 D
   (c) +7.0 D
   (d) −7.0 D

7. Under which of the following conditions can a concave mirror form a virtual, erect, and magnified image?
   (a) When object is at the centre of curvature
   (b) When object is between focus and centre of curvature
   (c) When object is placed between pole and principal focus
   (d) When object is at infinity

ABC Paths, Kolhapur

8. The absolute refractive index of a medium cannot be less than 1 because:

(a) Light travels slowest in vacuum

(b) Speed of light in any medium cannot exceed speed in vacuum

(c) Density of all media is less than vacuum

(d) Refractive index is independent of light speed

Directions for Q9 and Q10: In each question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Mark the correct choice as:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

9. **Assertion (A):** A ray of light passing through the optical centre of a thin lens emerges without undergoing any deviation.
Reason (R): The central region of a thin lens acts approximately like a thin parallel-sided glass slab.

10. **Assertion (A):** Convex mirrors are commonly preferred as rear-view (wing) mirrors in automobiles.
Reason (R): A convex mirror always gives an erect, magnified image of distant objects.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. State the two fundamental laws of refraction of light. Express Snell's law mathematically.

12. A concave mirror has a radius of curvature of 30 cm.
    a. What is its focal length?
    b. Where should an object be placed in front of this mirror to get an inverted image of the exact same size as the object?

13. A doctor prescribes a corrective lens of power −2.5 D to a patient.
    a. Find the focal length of the prescribed lens in centimetres.
    b. Is the prescribed lens converging or diverging in nature?

14. The absolute refractive index of diamond is 2.42. What is the physical significance of this statement? Calculate the speed of light in diamond (Speed of light in vacuum = 3×10^8 m/s).

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. A 2.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm.
    a. Find the position and nature of the image formed.
    b. Calculate the magnification and the height of the image.

16. Draw ray diagrams to illustrate the path of reflected rays for:
    a. A ray parallel to the principal axis incident on a concave mirror.
    b. A ray passing through the principal focus of a convex mirror.
    c. A ray directed towards the centre of curvature of a concave mirror.

17. Explain the following optical phenomena with appropriate scientific reasoning:
    a. A straight pencil partially immersed in water appears bent at the water-air interface.
    b. A lemon kept in a glass tumbler filled with water appears larger than its actual size when viewed from the sides.
    c. Dentists use concave mirrors rather than convex or plane mirrors to examine teeth.

AR's Paths, Kolhapur

SECTION – D

Question 18 carries 5 marks.

18. a. Derive the relationship between the angle of incidence (i) and the angle of emergence (e) for a light ray refracting through a rectangular glass slab. Draw a neat labelled diagram showing lateral displacement.

b. List two physical factors on which the magnitude of lateral displacement depends.

c. A ray of light traveling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Explain why.

OR

a. State the New Cartesian Sign Convention rules for reflection of light by spherical mirrors regarding:
(i) Object distance (u) (ii) Focal length of concave and convex mirrors (iii) Heights measured above and below the principal axis.

b. A convex mirror used for rear-view on an automobile has a radius of curvature of 3.00 m. If a bus is located at 5.00 m from this mirror:

i. Find the position, nature, and magnification of the image of the bus.

ii. Draw a supporting ray diagram to demonstrate the formation of this image.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. **Read the passage given below and answer the questions that follow:**

> *Solar concentrators and thermal solar devices utilize large concave mirrors to collect and focus parallel solar radiation onto a central focal receiver. When a beam of sunlight—which arrives as parallel rays of light—falls on a concave spherical mirror, all rays converge to a single focal point on the principal axis in front of the mirror. This intense concentration of thermal radiation produces high temperatures capable of boiling water, generating high-pressure steam to drive turbines, or melting metals. The performance depends critically on accurate alignment along the principal axis.*

a. What type of mirror is best suited for designing a solar furnace and why? **[1 Mark]**

b. If a solar collector uses a concave reflector with a radius of curvature of 80 cm, at what distance from the pole should the heating boiler pipe be mounted? **[1 Mark]**

c. A student holds a concave mirror facing the sun and focuses its sharp image onto a sheet of paper.
(i) What happens to the sheet of paper after a short time?
(ii) What does the sharp point of light formed on the sheet represent? **[2 Marks]**

OR

c. Apart from solar furnaces, state two daily-life appliances where concave mirrors are used to produce powerful parallel beams of light. Explain how the light source is placed relative to the mirror. **[2 Marks]**

20. **Read the passage given below and answer the questions that follow:**

> *Lenses work on the principle of refraction of light through curved transparent boundaries. A convex lens acts as a converging lens because it refracts incident parallel light rays inward towards its real principal focus. The degree of convergence or divergence achieved by a lens depends directly upon its focal length. The power of a lens is quantitatively defined as the reciprocal of its focal length expressed in metres. Thicker lenses with greater surface curvature have shorter focal lengths and therefore bend light rays more sharply, yielding higher optical power.*

a. Define 1 Dioptre of power of a lens. **[1 Mark]**

b. A student tests two convex lenses, L_1 of focal length 20 cm and L_2 of focal length 10 cm. Which lens has greater power to converge light rays? **[1 Mark]**

ABS Paths, Kolhapur

c. An illuminated candle flame is placed at a distance of 60 cm in front of a convex lens of focal length 30 cm.
(i) Where should a screen be positioned behind the lens to catch a sharp image?
(ii) What will be the nature and size of the flame image on the screen? **[2 Marks]**

OR

c. A concave lens has a focal length of 15 cm. At what distance should an object be placed from the lens so that it forms an image at 10 cm from the lens? Determine the magnification produced. **[2 Marks]**

AB's Paths, Kolhapur