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Light – Reflection and Refraction — CBSE Class 10 Science Chapter Test

FREE CHAPTER TEST · CLASS X · SCIENCE (086) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	20 (A 10 · B 4 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 20 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–14 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q15–17 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q18 is a long answer (LA) type question, carrying 5 marks.
7. In Section E, Q19–20 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class X Science (086) Sample Question Paper 2026-27, at about half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Light – Reflection and Refraction · **Topics:** Spherical mirrors · Image formation by mirrors · Mirror formula and magnification · Uses of mirrors · Refraction and its laws · Refractive index · Image formation by lenses · Lens formula, magnification and power

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. A spherical mirror has a radius of curvature of 30 cm. Its focal length is 1

(A) 30 cm (B) 60 cm

(C) 7.5 cm (D) 15 cm

2. The image formed by a convex mirror, for any position of the object in front of it, is always 1

(A) virtual, erect and diminished (B) real, inverted and diminished

(C) virtual, erect and enlarged (D) real, erect and of the same size

3. An object is placed 20 cm in front of a convex lens of focal length 10 cm. The image is 1

(A) at infinity and highly enlarged (B) between F and 2F, and diminished

(C) at 2F on the other side; real, inverted and of the same size (D) on the same side as the object; virtual and erect

4. The power of a concave lens of focal length 25 cm is 1

(A) +4 D (B) −4 D

(C) −0.25 D (D) +25 D

5. The refractive index of a medium is 1.5. If the speed of light in vacuum is 3×10^8 m/s, the speed of light in the medium is 1

(A) 4.5×10^8 m/s (B) 2×10^8 m/s

(C) 3×10^8 m/s (D) 1.5×10^8 m/s

6. The rear-view mirror of a vehicle is a 1

(A) concave mirror (B) plane mirror

(C) convex lens (D) convex mirror

7. A spherical mirror produces an image with magnification +1/3. The image is 1

(A) virtual, erect and diminished (B) real, inverted and diminished

(C) real, erect and enlarged (D) virtual, inverted and enlarged

8. A ray of light passes obliquely from air into glass. On entering the glass it 1

(A) bends away from the normal (B) goes straight on without bending

(C) bends towards the normal (D) travels along the surface

9. **Assertion (A):** Dentists use concave mirrors to see large images of teeth. 1
Reason (R): When an object is placed between the pole and the focus of a concave mirror, an enlarged, erect and virtual image is formed.

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** The ray that emerges from a rectangular glass slab is parallel to the ray that enters it. 1
Reason (R): Light travels faster in glass than in air.

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

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 4 very short answer (VSA) type questions of 2 marks each.

11. (a) An object is placed 10 cm in front of a concave mirror of focal length 15 cm. Find the position of the image and its magnification, and describe the image. 2

OR

(b) An object is placed 30 cm in front of a convex mirror of focal length 20 cm. Find the position of the image and its magnification, and describe the image.

12. The refractive index of a flint glass is 1.6. What does this mean? Find the speed of light in this glass (speed of light in vacuum = 3×10^8 m/s). 2

13. A convex lens of focal length 25 cm and a concave lens of focal length 50 cm are placed in contact. Find the power and focal length of the combination. Is it converging or diverging? 2

14. The refractive index of kerosene is 1.44 and that of a glass is 1.5. Find the refractive index of the glass with respect to kerosene. In which of the two does light travel faster? 2

SECTION C

This section comprises 3 short answer (SA) type questions of 3 marks each.

15. (a) An object 4 cm high is placed 25 cm in front of a convex lens of focal length 15 cm. Find (i) the position of the image, (ii) its magnification and size, (iii) the nature of the image. 3

OR

(b) An object 5 cm high is placed 30 cm in front of a concave lens of focal length 20 cm. Find (i) the position of the image, (ii) its magnification and size, (iii) the nature of the image.

16. An object 5 cm high is placed 30 cm in front of a concave mirror, and a sharp image is obtained on a screen placed 60 cm in front of the mirror. Find (i) the focal length of the mirror, (ii) the magnification and the size of the image. (iii) Is the image real or virtual? 3

17. A convex lens forms a real image three times the size of the object on a screen 60 cm from the lens. Find (i) the distance of the object from the lens, (ii) the focal length and (iii) the power of the lens. 3

SECTION D

This section comprises 1 long answer (LA) type questions of 5 marks each.

18. (a) An object 4 cm high is placed in front of a concave mirror of focal length 12 cm. Using the mirror formula, find the position, size and nature of the image when the object is (i) 36 cm, (ii) 24 cm, (iii) 18 cm and (iv) 6 cm from the mirror. (v) Where should a bulb be placed in front of this mirror to obtain a parallel beam of light, as in a torch? 5

OR

(b) (i) State the first law of refraction of light.
(ii) State Snell's law.
(iii) The speed of light in a medium A is 2.25×10^8 m/s. Find its absolute refractive index ($c = 3 \times 10^8$ m/s).
(iv) Medium B has an absolute refractive index of 1.5. Find the refractive index of B with respect to A, and say which medium is optically denser.
(v) How does a ray going obliquely from A into B bend, and why?

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

19. The rear-view mirror of a car is a convex mirror with a radius of curvature of 4 m. The driver sees in it a scooter that is 8 m behind the car.

(i) What is the focal length of the mirror? [1]

(ii) Describe the nature of the image of the scooter. [1]

(iii) Find the position of the image of the scooter and its magnification. [2]

OR

(iii) Give two reasons why convex mirrors are preferred as rear-view mirrors. [2]

20. A student focuses the image of a distant tree through a convex lens onto a screen, and finds the sharpest image when the screen is 20 cm from the lens.

(i) What is the focal length of the lens? [1]

(ii) What is the power of the lens? [1]

(iii) A candle is now placed 30 cm from the lens. Find where the screen must be placed to get a sharp image, and the magnification. [2]

OR

(iii) The convex lens is placed in contact with a concave lens of power −10 D. Find the power and focal length of the combination, and say whether it is converging or diverging. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(D)	(A)	(C)	(B)	(B)	(D)	(A)	(C)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (D). For a spherical mirror of small aperture, R = 2f, so f = 30/2 = 15 cm.

Q2. Answer (A). A convex mirror always forms a virtual, erect, diminished image behind the mirror, between P and F.

Q3. Answer (C). u = −20 cm, f = +10 cm: 1/v = 1/10 − 1/20 = 1/20, v = +20 cm; m = v/u = −1: real, inverted, same size, at $2F_2$.

Q4. Answer (B). P = 1/f with f in metres: f = −0.25 m, so P = −4 D (negative for a diverging lens).

Q5. Answer (B). n = c/v, so v = c/n = $3 \times 10^8/1.5 = 2 \times 10^8$ m/s.

Q6. Answer (D). A convex mirror gives an erect, diminished image and a much wider field of view.

Q7. Answer (A). A positive magnification means a virtual, erect image; a value less than 1 means it is diminished (as given by a convex mirror).

Q8. Answer (C). Glass is optically denser than air; light slows down in it and bends towards the normal.

Q9. Answer (A). Both true, and R explains A: with the tooth closer than F, the dentist sees an enlarged, erect image. Answer (A).

Q10. Answer (C). A is true: the bending at the two parallel faces is equal and opposite. R is false: light travels slower in glass. Answer (C).

Q11. (2 marks) Answer: (a) 30 cm behind the mirror, m = +3, virtual, erect, enlarged; (b) 12 cm behind, m = +0.4, virtual, erect, diminished.
(a) u = −10 cm, f = −15 cm. 1/v = 1/f − 1/u = −1/15 + 1/10 = 1/30, so v = +30 cm: 30 cm behind the mirror. [1]
m = −v/u = −30/(−10) = +3: the image is virtual, erect and three times the size of the object. [1]
OR (b) u = −30 cm, f = +20 cm. 1/v = 1/20 + 1/30 = 1/12, so v = +12 cm (behind the mirror). [1]
m = −v/u = −12/(−30) = +0.4: virtual, erect and diminished. [1]

Q12. (2 marks) Answer: c in vacuum is 1.6 times the speed in the glass; 1.875×10^8 m/s.
It means that the speed of light in air (vacuum) is 1.6 times its speed in the glass. [1]
v = c/n = $3 \times 10^8/1.6 = 1.875 \times 10^8$ m/s. [1]

Q13. (2 marks) Answer: +2 D; 50 cm; converging.
P_1 = 1/0.25 = +4 D; P_2 = 1/(−0.5) = −2 D; P = P_1 + P_2 = +2 D. [1]
f = 1/P = 0.5 m = 50 cm; the power is positive, so the combination is converging. [1]

Q14. (2 marks) Answer: About 1.04; faster in kerosene.
n(glass, kerosene) = n(glass)/n(kerosene) = 1.5/1.44 ≈ 1.04. [1]
Light travels faster in kerosene, which has the smaller refractive index (it is optically rarer). [1]

Q15. (3 marks) Answer: (a) 37.5 cm on the other side; m = −1.5, 6 cm; real, inverted, enlarged; (b) 12 cm on the same side; m = +0.4, 2 cm; virtual, erect, diminished.
(a) (i) u = −25 cm, f = +15 cm. 1/v = 1/f + 1/u = 1/15 − 1/25 = 2/75, so v = +37.5 cm, on the other side of the lens. [1]
(ii) m = v/u = 37.5/(−25) = −1.5; h′ = −1.5 × 4 = −6 cm. [1]
(iii) Real, inverted and enlarged (6 cm high). [1]
OR (b) (i) u = −30 cm, f = −20 cm. 1/v = −1/20 − 1/30 = −1/12, so v = −12 cm, on the same side as the object. [1]
(ii) m = v/u = −12/(−30) = +0.4; h′ = 0.4 × 5 = 2 cm. [1]
(iii) Virtual, erect and diminished. [1]

Q16. (3 marks) Answer: (i) 20 cm (f = −20 cm); (ii) −2, 10 cm, inverted; (iii) real.
(i) u = −30 cm, v = −60 cm. 1/f = 1/v + 1/u = −1/60 − 1/30 = −1/20, so f = −20 cm (focal length 20 cm). [1]
(ii) m = −v/u = −(−60)/(−30) = −2; h′ = −2 × 5 = −10 cm: the image is 10 cm high and inverted. [1]
(iii) Real: it is formed on a screen, in front of the mirror. [1]

Q17. (3 marks) Answer: (i) 20 cm; (ii) 15 cm; (iii) about +6.7 D.
(i) The image is real, so it is inverted: m = v/u = −3 with v = +60 cm, so u = −20 cm: the object is 20 cm from the lens. [1]
(ii) 1/f = 1/v − 1/u = 1/60 + 1/20 = 4/60 = 1/15, so f = 15 cm. [1]
(iii) P = 1/0.15 m ≈ +6.7 D. [1]

Q18. (5 marks) Answer: (a) (i) 18 cm in front, 2 cm, real, inverted, diminished; (ii) 24 cm in front, 4 cm, same size; (iii) 36 cm in front, 8 cm, enlarged; (iv) 12 cm behind, 8 cm, virtual, erect; (v) at F; (b) laws of refraction; 4/3; 9/8, B denser; towards the normal.
(a) f = −12 cm; v from 1/v = 1/f − 1/u and m = −v/u.
(i) u = −36: v = −18 cm, m = −1/2: real, inverted, diminished, 2 cm high. [1]
(ii) u = −24 (at C): v = −24 cm, m = −1: real, inverted, same size, 4 cm. [1]
(iii) u = −18: v = −36 cm, m = −2: real, inverted, enlarged, 8 cm. [1]
(iv) u = −6: v = +12 cm (behind the mirror), m = +2: virtual, erect, enlarged, 8 cm. [1]
(v) At the principal focus, 12 cm from the mirror. [1]
OR (b) (i) The incident ray, the refracted ray and the normal at the point of incidence all lie in the same plane. [1]
(ii) Snell's law: for a given colour of light and a given pair of media, sin i / sin r is a constant (the refractive index of the second medium with respect to the first). [1]
(iii) $n = c/v = 3 \times 10^8 / 2.25 \times 10^8 = 4/3 \approx 1.33$. [1]
(iv) n(B, A) = n(B)/n(A) = 1.5/(4/3) = 9/8 ≈ 1.13; B has the larger refractive index, so it is optically denser. [1]
(v) A ray going from A into B bends towards the normal, because it slows down on entering the denser medium. [1]

Q19. (4 marks) Answer: (i) 2 m; (ii) virtual, erect, diminished; (iii)(a) 1.6 m behind, +0.2; (b) erect image, wider field of view.
(i) f = R/2 = +2 m. [1]
(ii) Virtual, erect and diminished. [1]
(iii)(a) u = −8 m, f = +2 m: 1/v = 1/2 + 1/8 = 5/8, so v = +1.6 m, behind the mirror. [1]
m = −v/u = −1.6/(−8) = +0.2. [1]
OR (iii)(b) They always give an erect, though diminished, image. [1]
They are curved outwards, so they give a much wider field of view, letting the driver see a large area behind. [1]

Q20. (4 marks) Answer: (i) 20 cm; (ii) +5 D; (iii)(a) 60 cm, −2; (b) −5 D, −20 cm, diverging.
(i) 20 cm: rays from a distant object meet at the focus. [1]
(ii) P = 1/0.20 = +5 D. [1]
(iii)(a) u = −30 cm, f = +20 cm: 1/v = 1/20 − 1/30 = 1/60, so v = +60 cm: the screen must be 60 cm from the lens. [1]
m = v/u = 60/(−30) = −2 (real, inverted, enlarged). [1]
OR (iii)(b) P = +5 − 10 = −5 D. [1]
f = 1/P = −0.2 m = −20 cm: diverging. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: every image position and magnification from the mirror or lens formula in the New Cartesian sign convention (exact fractions), powers from P = 1/f and refractive indices from n = c/v.