CBSE CLASS X

Science (086)

QUESTION PAPER

AI-generated question paper

Code: OHFEH2 **Questions: 34** **Maximum Marks: 71** **Generated: 2026-06-25 17:55**

SELECTIONS USED

Subject	Science
Lessons	9 Light – Reflection and Refraction
Level of understanding	Exam-ready
Question selection	CBSE board paper, whole lesson (~80 marks across Sections A-E)
Model	claude-sonnet-4-6

Composition — Difficulty: 10 straightforward · 19 medium · 5 deep | Types: 13 MCQ · 6 Short · 5 Assertion–reason · 4 Very short · 3 Long · 3 Case-based | Sections: A 18Q/18m · B 4Q/8m · C 6Q/18m · D 3Q/15m · E 3Q/12m

Q1. straightforward exam-ready **[1]**

An object is placed between the pole and the principal focus of a concave mirror. The image formed is:
(A) Real, inverted and diminished
(B) Real, inverted and enlarged
(C) Virtual, erect and enlarged
(D) Virtual, erect and diminished

A Real, inverted and diminished
B Real, inverted and enlarged
C Virtual, erect and enlarged
D Virtual, erect and diminished

◆ Light – Reflection and Refraction

Q2. straightforward exam-ready **[1]**

A ray of light travelling obliquely from glass into air will:
(A) Bend towards the normal
(B) Bend away from the normal
(C) Continue in the same direction without bending
(D) Be completely absorbed

A Bend towards the normal
B Bend away from the normal
C Continue in the same direction without bending
D Be completely absorbed

◆ Light – Reflection and Refraction

Q3. straightforward exam-ready **[1]**

According to the New Cartesian Sign Convention for spherical mirrors, an object is placed at a distance of 15 cm in front of a mirror. Which of the following correctly represents the object distance u?

(A) u = +15 cm, measured to the right of the pole

(B) u = −15 cm, measured to the left of the pole

(C) u = +15 cm, measured from the principal focus

(D) u = −15 cm, measured to the right of the pole

A All distances are measured from the principal focus.

B Distances measured to the right of the pole are negative.

C Distances measured to the left of the pole are negative.

D The object is always placed to the right of the mirror.

◆ **Light – Reflection and Refraction**

Q4. medium exam-ready **[1]**

A convex lens of focal length 20 cm is used to form an image of an object placed at 20 cm from it. The image is formed:

(A) At 20 cm on the same side as the object

(B) At infinity

(C) At 40 cm on the other side

(D) At 10 cm on the other side

A At 20 cm on the same side as the object

B At infinity

C At 40 cm on the other side

D At 10 cm on the other side

◆ **Light – Reflection and Refraction**

Q5. medium exam-ready **[1]**

A spherical mirror has a focal length of −12 cm. This mirror is:

(A) Convex, with radius of curvature 24 cm

(B) Concave, with radius of curvature 6 cm

(C) Concave, with radius of curvature 24 cm

(D) Convex, with radius of curvature 6 cm

A Convex, with radius of curvature 24 cm

B Concave, with radius of curvature 6 cm

C Concave, with radius of curvature 24 cm

D Convex, with radius of curvature 6 cm

◆ **Light – Reflection and Refraction**

Q6. straightforward exam-ready **[1]**

The power of a lens is −4.0 D. The focal length and type of lens are:

(A) +25 cm, convex

(B) −25 cm, concave

(C) +40 cm, convex

(D) −40 cm, concave

A +25 cm, convex

B −25 cm, concave

C +40 cm, convex

D −40 cm, concave

◆ **Light – Reflection and Refraction**

Q7. straightforward exam-ready **[1]**

Among the following media, light travels fastest in:
(A) Water
(B) Crown glass
(C) Diamond
(D) Air

A Water
B Crown glass
C Diamond
D Air

◆ **Light – Reflection and Refraction**

Q8. straightforward exam-ready **[1]**

A concave lens always produces an image that is:
(A) Real, inverted and diminished
(B) Virtual, erect and diminished
(C) Real, erect and enlarged
(D) Virtual, inverted and enlarged

A Real, inverted and diminished
B Virtual, erect and diminished
C Real, erect and enlarged
D Virtual, inverted and enlarged

◆ **Light – Reflection and Refraction**

Q9. straightforward exam-ready **[1]**

A driver notices that the image of a car behind appears smaller than the actual car and always remains upright, regardless of how close the following car is. The rear-view mirror being used is most likely:
(A) A plane mirror, because it forms images of the same size
(B) A concave mirror, because it forms magnified images
(C) A convex mirror, because it provides a wider field of view and always forms an erect image
(D) A concave mirror, because it forms real images of distant objects

A Forms a magnified image of the traffic behind
B Produces a real image of objects
C Provides a wider field of view and always gives an erect image
D Focuses light onto a single point

◆ **Light – Reflection and Refraction**

Q10. medium exam-ready **[1]**

The magnification produced by a spherical mirror is given by m = −v/u. If m = +0.5 for a mirror, which of the following is correct?

(A) The image is real, inverted and diminished.

(B) The image is virtual, erect and diminished.

(C) The image is real, erect and enlarged.

(D) The image is virtual, inverted and enlarged.

A The image is real, inverted and diminished.

B The image is virtual, erect and diminished.

C The image is real, erect and enlarged.

D The image is virtual, inverted and enlarged.

◆ Light – Reflection and Refraction

Q11. straightforward exam-ready **[1]**

When a ray of light passes through the optical centre of a lens, it:

(A) Bends towards the principal axis

(B) Bends away from the principal axis

(C) Passes through the principal focus

(D) Emerges without any deviation

A Bends towards the principal axis

B Bends away from the principal axis

C Passes through the principal focus

D Emerges without any deviation

◆ Light – Reflection and Refraction

Q12. medium exam-ready **[1]**

Two thin lenses of powers +3.5 D and −1.5 D are placed in contact with each other. The power of the combination is:

(A) −2.0 D

(B) +5.0 D

(C) +2.0 D

(D) −5.0 D

A −2.0 D

B +5.0 D

C +2.0 D

D −5.0 D

◆ Light – Reflection and Refraction

Q13. straightforward exam-ready **[1]**

A surgeon uses a mirror to obtain a large, clear view of a patient's eye during an examination. The object (eye) must be placed very close to the mirror. Which type of mirror is used, and why?
(A) Convex mirror, because it always forms a magnified image
(B) Concave mirror, because when the object is within the focal length, it forms a magnified, virtual, erect image
(C) Plane mirror, because it forms an image of the same size
(D) Concave mirror, because it always forms a real and enlarged image

A Rear-view mirror in a car
B Mirror in a shopping mall for security
C Shaving mirror
D Convex mirror on a road bend

◆ **Light – Reflection and Refraction**

Q14. medium exam-ready **[1]**

Assertion (A): When a light ray travels from water into glass, it bends towards the normal.
Reason (R): Glass has a higher refractive index than water, making it optically denser.

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.

◆ **Light – Reflection and Refraction**

Q15. medium exam-ready **[1]**

Assertion (A): A convex lens can produce both real and virtual images depending on the position of the object.
Reason (R): When the object is placed between the optical centre and the principal focus of a convex lens, the image formed is virtual and erect.

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.

◆ **Light – Reflection and Refraction**

Q16. medium exam-ready **[1]**

Assertion (A): The emergent ray from a rectangular glass slab is parallel to the incident ray but displaced laterally.
Reason (R): At both parallel surfaces of the slab, refraction occurs such that the bending at the first surface is exactly reversed at the second surface, resulting in zero net angular deviation.

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.

◆ **Light – Reflection and Refraction**

Q17. deep exam-ready **[1]**

Assertion (A): Optical density and mass density of a medium always increase together.
Reason (R): Kerosene has a higher refractive index than water but has a lower mass density than water.

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 false and R is true.
D Both A and R are false.

◆ Light – Reflection and Refraction

Q18. medium exam-ready **[1]**

Assertion (A): The focal length of a concave mirror is negative under the New Cartesian Sign Convention.
Reason (R): The principal focus of a concave mirror lies in front of the mirror, on the same side as the incoming light, which is the negative side of the axis.

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.

◆ Light – Reflection and Refraction

Q19. medium exam-ready **[2]**

The absolute refractive index of diamond is 2.42. What does this mean physically? If the speed of light in air is 3×10^8 m s^{-1}, calculate the speed of light in diamond.

◆ Light – Reflection and Refraction

Q20. straightforward exam-ready **[2]**

An object is placed at the centre of curvature C of a concave mirror of focal length 15 cm. State the position, size and nature of the image formed. Using the mirror formula, verify the image distance.

◆ Light – Reflection and Refraction

Q21. medium exam-ready **[2]**

A spherical mirror produces a magnification of −3 for an object placed 10 cm in front of it. (i) What does the negative sign indicate about the image? (ii) Calculate the image distance. (iii) Is the mirror concave or convex? Justify.

◆ Light – Reflection and Refraction

Q22. medium exam-ready **[2]**

Why does a coin placed at the bottom of a water-filled bowl appear to be at a shallower depth than it actually is?

◆ Light – Reflection and Refraction

Q23. medium exam-ready **[3]**

An object 3 cm tall is placed 12 cm in front of a concave mirror of focal length 8 cm. Using the mirror formula, find (i) the image distance and (ii) the height of the image. State the nature of the image.

◆ Light – Reflection and Refraction

Q24. medium exam-ready **[3]**

A student places a candle 6 cm from a convex lens of focal length 10 cm. (i) Draw a labelled ray diagram to show the formation of the image. (ii) State the position (in front of or behind the lens), nature and size of the image relative to the object. (iii) Can this image be obtained on a screen? Give a reason.

◆ Light – Reflection and Refraction

Q25. medium exam-ready **[3]**

A ray of light enters a glass slab (refractive index 1.5) at an angle of incidence of 45°. (i) Calculate the angle of refraction inside the glass. (ii) When the ray reaches the second parallel surface of the slab, does it bend towards or away from the normal? Give a reason. (iii) How does the speed of light inside the glass compare to its speed in air?

◆ Light – Reflection and Refraction

Q26. deep exam-ready **[3]**

The refractive index of medium A with respect to medium B is 2/3, and the refractive index of medium B with respect to air is 1.5. Which medium — A, B, or air — has (i) the highest optical density and (ii) the lowest optical density? Justify your answer.

◆ Light – Reflection and Refraction

Q27. medium exam-ready **[3]**

An optician prescribes spectacle lenses of power +2.0 D for one eye and −0.5 D for the other. (i) What is the focal length of each lens? (ii) What type is each lens? (iii) If both lenses were placed in contact, what would be the power of the combination?

◆ Light – Reflection and Refraction

Q28. medium exam-ready **[3]**

How does the image formed by a convex mirror change as an object is moved from infinity towards the pole of the mirror? What property of the convex mirror makes it suitable for use in shopping malls and on road bends?

◆ Light – Reflection and Refraction

Q29. medium exam-ready **[5]**

(a) State the mirror formula and define each term in it.
(b) A concave mirror has a focal length of 25 cm. An object is placed 40 cm in front of it. Find the position of the image. Is the image real or virtual?
(c) Now find the magnification. If the object is 2 cm tall, what is the height of the image? State whether the image is erect or inverted.

◆ Light – Reflection and Refraction

Q30. deep exam-ready **[5]**

(a) With the help of labelled ray diagrams, show the formation of image by a concave mirror when the object is (i) beyond C and (ii) between P and F.
(b) State the nature, position and relative size of the image in each case.
(c) A dentist uses a concave mirror to examine a tooth. The tooth is placed 2 cm from the mirror. The focal length of the mirror is 8 cm. Find the position and magnification of the image. Explain why this is suitable for the dentist's purpose.

◆ Light – Reflection and Refraction

Q31. deep exam-ready **[5]**

(a) The speed of light in medium X is 2×10^8 m s^{-1} and in medium Y is 1.5×10^8 m s^{-1}. Calculate the refractive index of Y with respect to X. Which medium is optically denser?
(b) A ray of light passes from medium X into medium Y. Using Snell's law, determine whether the ray bends towards or away from the normal at the interface.
(c) A convex lens of focal length 15 cm and a concave lens of focal length 30 cm are placed in contact coaxially. (i) Find the power of each lens. (ii) Find the power and focal length of the combination. (iii) State whether the combination behaves as a converging or a diverging lens.

◆ Light – Reflection and Refraction

Q32. deep exam-ready **[4]**

A student conducts an experiment to study image formation by a convex lens. She places a burning candle at various distances from the lens (focal length = 10 cm) and records the image position and nature on a screen. When the candle is 30 cm from the lens, she gets a sharp image on the screen. When she moves the candle to 8 cm from the lens, she cannot get an image on the screen at all but sees a magnified image when she looks through the lens from the other side.

(i) Using the lens formula, verify the image distance when the object is at 30 cm from the lens. [1 mark]
(ii) Why can the student not obtain an image on the screen when the candle is at 8 cm? Describe the nature and position of the image formed. [1 mark]
(iii) Calculate the magnification when the object is at 30 cm. Is the image erect or inverted? [1 mark]
(iv) Name one common optical instrument that uses the principle of image formation observed when the candle is at 8 cm from the lens. [1 mark]

◆ **Light – Reflection and Refraction**

Q33. medium exam-ready **[4]**

A physics teacher demonstrates an experiment with a concave mirror of focal length 15 cm. She places a lighted candle at four different positions: (a) 40 cm, (b) 30 cm, (c) 15 cm, and (d) 10 cm from the mirror. She asks students to predict the nature, position and size of the image in each case.

(i) For object distance 40 cm, what is the image distance? Is the image real or virtual? [1 mark]
(ii) At which of the four positions will the image be the same size as the object? [1 mark]
(iii) At which position will no image be formed on the screen? Why? [1 mark]
(iv) For object distance 10 cm, state the nature and approximate position of the image. [1 mark]

◆ **Light – Reflection and Refraction**

Q34. medium exam-ready **[4]**

Riya is reading about refraction and comes across a table of refractive indices. She notes: air (1.0003), water (1.33), kerosene (1.44), crown glass (1.52) and diamond (2.42). She also reads that refraction is caused by the change in speed of light as it moves from one medium to another.

(i) In which of the listed media does light travel at the lowest speed? Justify your answer. [1 mark]
(ii) Riya notices that kerosene has a higher refractive index than water. Does this mean kerosene is also more mass-dense than water? Explain. [1 mark]
(iii) A light ray travels from water into crown glass. Does it bend towards or away from the normal? Give a reason. [1 mark]
(iv) If the speed of light in vacuum is 3×10^8 m s^{-1}, calculate the speed of light in crown glass. [1 mark]

◆ **Light – Reflection and Refraction**

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