CBSE CLASS X

Science (086)

QUESTION PAPER

From previous CBSE Board Exam questions

Code: WVJAJL **Questions: 70** **Maximum Marks: 195** **Generated: 2026-06-15 13:05**

SELECTIONS USED

Source	Previous-year board
Subject	Science
Lessons	Light – Reflection and Refraction
Year	2022-2026
Questions selected	70

Composition — Types: 18 Short · 17 MCQ · 13 Very short · 13 Long · 7 source_based · 2 Case-based

Q1. § 9.1 REFLECTION OF LIGHT § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[4]**

> The above ray diagram is to show image formation by a reflecting telescope. Reflecting telescope revolutionized our way of looking into the sky. Reflecting telescopes employ large mirrors to gather and focus light rather than relying solely on lenses as we do in the refracting telescopes. These telescopes utilize precisely shaped and polished mirrors to capture incoming light and reflect it to a focal point, where the telescope forms an image for observation.

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Answer the following :

(a) What kind of image of a star is seen by the observer in the eye-piece ? [1]

(b) What kind of mirror is used in this reflecting telescope ? [1]

(c) Explain with the reason, what kind of optical device (type of lens or mirror) is used at the eye-piece. [2]

Previously asked in: 2026 31/4/1 Q38

◆ **Light – Reflection and Refraction** Reflection of Light by Spherical Mirrors

Q2. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.4 Mirror Formula and Magnification **[1]**

A student wants to obtain an erect image of an object using a concave mirror of 10 cm focal length. What will be the distance of the object from mirror ?

(a) Less than 10 cm
(b) 10 cm
(c) between 10 cm and 20 cm
(d) more than 20 cm

Previously asked in: 2023 31/6/1 Q7

◆ **Light – Reflection and Refraction** Erect image formation by concave mirror (object placed between pole and focus)

Q3. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.4 Mirror Formula and Magnification **[2]**

An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position of the image formed by the mirror.

Previously asked in: 2024 31/1/1 Q24

◆ **Light – Reflection and Refraction** Mirror Formula and Image Formation by Convex Mirror

Q4. § 9.2.1 Image Formation by Spherical Mirrors **[5]**

Answer the following :

(i) A student wishes to study the image formation by a concave mirror using candle flame as object. State the type of the image formed by the mirror and mention the change in the image formed, if any, that he observes when the candle flame is gradually moved away from the pole of the mirror. Draw a ray diagram to show the image formation when the object distance is nearly equal to the radius of curvature of the mirror. [3]

(ii) A convex mirror used for rear-view on an automobile has a focal length of 3·0 m. If a bus is located at 6·0 m from this mirror, use mirror formula to find the position of the image of the bus as seen in the mirror. [2]

Previously asked in: 2025 31/3/1 Q36(b)

◆ **Light – Reflection and Refraction** Image formation by concave mirror – nature and position of image for various object distances Mirror formula – numerical application for convex mirror Ray diagrams for spherical mirrors

Q5. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams **[3]**

Draw ray diagrams to show the nature, position and relative size of the image formed by a convex mirror when the object is placed (i) at infinity and (ii) between infinity and pole P of the mirror.

Previously asked in: 2025 31/1/1 Q31

◆ **Light – Reflection and Refraction** Image formation by convex mirror – object at infinity Image formation by convex mirror – object between infinity and pole Ray diagrams for image formation by a convex mirror

Q6. § 9.1 REFLECTION OF LIGHT § 9.2.1 Image Formation by Spherical Mirrors § 9.2.3 Sign Convention for Reflection by Spherical Mirrors **[1]**

Mirror 'X' is used to concentrate sunlight in solar furnace and Mirror 'Y' is fitted on the side of the vehicle to see the traffic behind the driver. Which of the following statements are true for the two mirrors ?
(i) The image formed by mirror 'X' is real, diminished and at its focus.
(ii) The image formed by mirror 'Y' is virtual, diminished and erect.
(iii) The image formed by mirror 'X' is virtual, diminished and erect.
(iv) The image formed by mirror 'Y' is real, diminished and at its focus.

(A) (i) and (ii)
(B) (ii) and (iii)
(C) (iii) and (iv)
(D) (i) and (iv)

Previously asked in: 2025 31/1/1 Q13

◆ **Light – Reflection and Refraction** Concave mirror – image formation and applications (solar furnace) Convex mirror – image formation and applications (rear-view mirror)

Q7. § 9.2.3 Sign Convention for Reflection by Spherical Mirrors § 9.3.6 Sign Convention for Spherical Lenses **[1]**

An object is placed in front of a convex mirror at infinity. According to the New Cartesian Sign Convention, the sign of the focal length and the sign of the image distance in this case are respectively :

(a) +, –
(b) –, +
(c) –, –
(d) +, +

Previously asked in: 2023 31/2/1 Q13

◆ **Light – Reflection and Refraction** Image formation by convex mirror – object at infinity New Cartesian Sign Convention for mirrors

Q8. § 9.2.3 Sign Convention for Reflection by Spherical Mirrors § 9.3.1 Refraction through a Rectangular Glass Slab § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[1]**

An optical device 'X' is placed obliquely in the path of a narrow parallel beam of light. If the emergent beam gets displaced laterally, the device 'X' is :

(a) plane mirror
(b) convex lens
(c) glass slab
(d) glass prism

Previously asked in: 2025 31/4/1 Q11

◆ **Light – Reflection and Refraction** Lateral Displacement of Light through a Glass Slab

Q9. § 9.3.1 Refraction through a Rectangular Glass Slab **[2]**

Draw a ray diagram to show the path of a ray of light falling obliquely on one of the refracting faces of a triangular glass prism and mark the angle of deviation on it.

Previously asked in: 2025 31/3/1 Q25(b)

◆ **Light – Reflection and Refraction** Refraction through a Triangular Glass Prism and Angle of Deviation

Q10. § 9.2.3 Sign Convention for Reflection by Spherical Mirrors § 9.3.4 Image Formation by Lenses § 9.3.6 Sign Convention for Spherical Lenses **[1]**

In the given figure the angle of incidence and the angle of deviation respectively are :

(A) 1 and 5
(B) 7 and 6
(C) 7 and 4
(D) 1 and 6

Previously asked in: 2025 31/2/1 Q13

◆ **Light – Reflection and Refraction** Angle of Incidence and Angle of Deviation in Refraction/Prism

Q11. § 9.3.2 The Refractive Index **[3]**

Answer the following :

(a) Observe the given ray diagram and compare : (i) the speed of light in medium A and the speed of light in medium B. (ii) the optical densities of medium B and medium C.

(b) Draw a ray diagram for refraction where the optical density of medium 'A' becomes equal to the optical density of medium 'C' and optical density of medium 'B' is greater than the optical density of medium 'A' and medium 'C'.

Previously asked in: 2026 31/4/1 Q35

◆ **Light – Reflection and Refraction** Refraction of light and optical density Refraction through media and ray diagrams

Q12. § 9.3.1 Refraction through a Rectangular Glass Slab § 9.3.2 The Refractive Index **[2]**

OR alternative for Q25.

(a) A ray of light starting from diamond is incident on the interface separating diamond and water. Draw a labelled ray diagram to show the refraction of light in this case. [1]

(b) Absolute refractive indices of diamond and water are 2.42 and 1.33 respectively. Find the value of refractive index of water w.r.t. diamond. [1]

Previously asked in: 2023 31/6/1 Q25(b)

◆ **Light – Reflection and Refraction** Refraction of light at an interface – ray diagram
Refractive index – relative refractive index from absolute refractive indices

Q13. § 9.3.2 The Refractive Index **[2]**

A light ray enters from medium A to medium B as shown in the figure.

(a) Which one of the two media is denser w.r.t. other medium ? Justify your answer. [1]

(b) If the speed of light in medium A is v_a and in medium B is v_b, what is the refractive index of B with respect to A. [1]

Previously asked in: 2023 31/6/1 Q25(a)

◆ **Light – Reflection and Refraction** Refraction of Light – Optical Density and Bending of Light
Refractive Index – Definition and Formula (n = v_a / v_b)

Q14. § 9.3.2 The Refractive Index **[2]**

Define the term absolute refractive index of a medium. A ray of light enters from vacuum to glass of absolute refractive index 1.5. Find the speed of light in glass. The speed of light in vacuum is 3×10^8 m/s.

Previously asked in: 2024 31/2/1 Q24(b)

◆ **Light – Reflection and Refraction** Absolute Refractive Index of a Medium
Relationship between Speed of Light and Refractive Index (n = c/v)

Q15. § 9.3.2 The Refractive Index **[5]**

Answer the following about refraction through three media.

(a) Observe the following diagram and compare (i) speed of light and (ii) optical densities of the three media A, B and C. Also give justification for your answer of any one of the two cases in terms of refractive indices of A, B and C.

(b) Redraw the path of a ray of light through the three media, if the ray of light starting from medium A falls on the medium B (i) Obliquely and the optical density of medium B is made more than that of A and C. (ii) The ray falls normally from medium A to medium B.

Previously asked in: 2025 31/5/1 Q36 (A)

◆ **Light – Reflection and Refraction** Bending of light at interfaces – oblique incidence and normal incidence
Refraction through multiple media – speed of light and optical density comparison Refractive index and optical density relationship

Q16. § 9.3.2 The Refractive Index **[2]**

The values of absolute refractive indices of kerosene and water are 1.44 and 1.33 respectively. Compare the two media on the basis of their
(a) optical density
(b) mass density
(c) relative speed of propagation of light.
What do you infer on the basis of above comparisons?

Previously asked in: 2025 31/5/1 Q24

◆ Light – Reflection and Refraction | Absolute refractive index and optical density | Optical density vs mass density | Speed of light in a medium and refractive index

Q17. § 9.3.2 The Refractive Index **[4]**

> The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser medium than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density.

Read the following and answer the questions:

(i) Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is 3×10^8 m/s. [1]

(ii) Refractive indices of glass, water and carbon disulphide are 1.5, 1.33 and 1.62 respectively. If a ray of light is incident in these media at the same angle (say θ), then write the increasing order of the angle of refraction in these media. [1]

(iii) Answer (A) or (B): [2]

Previously asked in: 2023 31/4/1 Q39

◆ Light – Reflection and Refraction | Refractive Index and Optical Density | Snell's Law and Angle of Refraction | Speed of Light in a Medium (n = c/v)

Q18. § 9.3.2 The Refractive Index **[1]**

Absolute refractive index of glass and water is 3/2 and 4/3 respectively. If the speed of light in glass is 2×10^8 m/s, the speed of light in water is :

A $9/4 \times 10^8$ m/s
B $5/2 \times 10^8$ m/s
C $7/3 \times 10^8$ m/s
D $16/9 \times 10^8$ m/s

Previously asked in: 2024 31/4/1 Q11

◆ Light – Reflection and Refraction | Refractive Index and Speed of Light

Q19. § 9.3.2 The Refractive Index **[1]**

Absolute refractive index of water and glass is 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 m/s, the speed of light in water is :

(A) $9/4 \times 10^8$ m/s
(B) $7/3 \times 10^8$ m/s
(C) $16/9 \times 10^8$ m/s
(D) $9/8 \times 10^8$ m/s

Previously asked in: 2025 31/3/1 Q11

◆ Light – Reflection and Refraction | Refractive Index and Speed of Light

Q20. § 9.3.2 The Refractive Index **[1]**

If the absolute refractive indices of two media X and Y are 6/5 and 4/3 respectively, then the refractive index of Y with respect to X will be :

(A) 10/9
(B) 9/10
(C) 9/8
(D) 8/9

Previously asked in: 2025 31/2/1 Q11

◆ Light – Reflection and Refraction | Relative refractive index between two media

Q21. § 9.3.2 The Refractive Index **[2]**

With the help of the given ray diagram, calculate the refractive index of Medium 2 with respect to Medium 1.
(Given that $\sqrt{3} = 1{\cdot}732$)

Previously asked in: 2026 31/2/1 Q33

◆ Light – Reflection and Refraction | Refraction of Light – Refractive Index and Snell's Law

Q22. § 9.3.2 The Refractive Index **[2]**

Answer the following:

(a) Relate the speed of light in the given medium with its optical density.

(b) Using the information given in the table below, arrange the medium A, B and C in the ascending order of their optical density.

Previously asked in: 2026 31/5/1 Q33

◆ Light – Reflection and Refraction | Optical density and speed of light in a medium | Refractive index and arrangement of media by optical density

Q23. § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[1]**

At what distance from a convex lens should an object be placed to get an image of the same size as that of the object on a screen ?

(a) Beyond twice the focal length of the lens.
(b) At the principal focus of the lens.
(c) At twice the focal length of the lens.
(d) Between the optical centre of the lens and its principal focus.

Previously asked in: 2024 31/1/1 Q12

◆ Light – Reflection and Refraction | Image formation by convex lens – object at 2F (same-size image)

Q24. § 9.3.7 Lens Formula and Magnification **[1]**

To get an image of magnification –1 on a screen using a lens of focal length 20 cm, the object distance must be :

(a) Less than 20 cm
(b) 30 cm
(c) 40 cm
(d) 80 cm

Previously asked in: 2025 31/4/1 Q10

◆ Light – Reflection and Refraction | Lens formula application | Magnification and image formation by convex lens

Q25. § 9.3.4 Image Formation by Lenses § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[2]**

The given figure shows image formation by a lens. Analyse the figure and answer the following questions :

(a) What is the type of lens used for image formation in the given ray diagram ?

(b) If the real image is formed at a distance of 30 cm from the lens and the size of image is twice the size of the object, then where was the object placed ?

Previously asked in: 2026 31/1/1 Q33

◆ **Light – Reflection and Refraction** Image formation by lenses

Q26. § 9.3.4 Image Formation by Lenses § 9.3.5 Image Formation in Lenses Using Ray Diagrams § 9.3.6 Sign Convention for Spherical Lenses **[1]**

A convex lens of focal length 15 cm, is forming a real image. If the size of image is same as the size of object, then position of object and position of image will be, respectively :

A – 15 cm and – 15 cm from lens
B – 15 cm and + 15 cm from lens
C – 30 cm and + 30 cm from lens
D – 30 cm and – 30 cm from lens

Previously asked in: 2026 31/1/1 Q30

◆ **Light – Reflection and Refraction** Image formation by convex lens (object at 2F)

Q27. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams **[5]**

Answer the following:

(i) Draw a ray diagram to show the path of the reflected ray in each of the following cases : A ray of light incident on a convex mirror (1) parallel to its principal axis, and (2) is directed towards its principal focus

(ii) A 1.5 cm tall candle flame is placed perpendicular to the principal axis of a concave mirror of focal length 12 cm. If the distance of the flame from the pole of the mirror is 18 cm, use mirror formula to determine the position and size of the image formed.

Previously asked in: 2024 31/3/1 Q36(b)

◆ **Light – Reflection and Refraction** Mirror formula and magnification – image formation by concave mirror
Ray diagrams for convex mirror – rays parallel to principal axis and directed towards principal focus

Q28. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[5]**

Answer the following:

(i) Draw a ray diagram to show the path of the refracted ray in each of the following cases : A ray of light incident on a concave lens (1) parallel to its principal axis, and (2) is directed towards its principal focus.

(ii) A 4 cm tall object is placed perpendicular to the principal axis of convex lens of focal length 24 cm. The distance of object from the lens is 16 cm. Find the position and size of image formed.

Previously asked in: 2024 31/3/1 Q36(a)

◆ **Light – Reflection and Refraction** Lens formula and magnification – image formation by convex lens
Ray diagrams for concave lens – refraction rules (ray parallel to principal axis and ray directed towards principal focus)

Q29. § 9.3.4 Image Formation by Lenses § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[5]**

Upper half of a convex lens is covered with a black paper. Draw a ray diagram to show the formation of image of an object placed at a distance of 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer.

Previously asked in: 2024 31/2/1 Q36(a)

◆ **Light – Reflection and Refraction** Effect of partially covering a lens on image formation
Image formation by a convex lens – object at 2F

Q30. § 9.3.2 The Refractive Index **[2]**

Study the figure in which the path of a ray of light going from Medium 1 to Medium 2 is shown.

(a) Out of the two Media – Medium 1 and Medium 2, in which is the speed of light more ?

(b) State reason of bending of the refracted ray away from the normal.

(c) Express refractive index of Medium 2 with respect to Medium 1 in terms of speed of light in two media.

Previously asked in: 2025 31/6/1 Q24

◆ **Light – Reflection and Refraction** Bending of Refracted Ray – Reason for Refraction Away from Normal
Refraction of Light – Speed of Light in Different Media Refractive Index in Terms of Speed of Light

Q31. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[1]**

Identify from the following the ray diagram which shows the correct path of the reflected ray for the ray incident on a concave mirror as shown :

(A) Reflected ray diagram A
(B) Reflected ray diagram B
(C) Reflected ray diagram C
(D) Reflected ray diagram D

Previously asked in: 2025 31/6/1 Q13

◆ **Light – Reflection and Refraction** Ray diagrams for concave mirror – rules of reflection

Q32. § 9.1 REFLECTION OF LIGHT § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[1]**

In order to obtain large images of the teeth of patients, the dentist holds the concave mirror in such a manner that the teeth are positioned

A at the focus of mirror.
B between pole and focus of the mirror.
C between focus and centre of curvature of the mirror.
D at the centre of curvature of the mirror.

Previously asked in: 2025 31/5/1 Q13

◆ **Light – Reflection and Refraction** Image formation by concave mirror – object between pole and focus (virtual, erect, magnified image)

Q33. § 9.2.1 Image Formation by Spherical Mirrors § 9.3.4 Image Formation by Lenses **[2]**

The heat produced at a point due to concentration of sunlight by a convex lens burns a paper.

(a) Explain why it happens. [1]

(b) Name the term (in the context of the lens used) given to the point at which the paper starts burning. What does the bright spot formed on the paper represent ? [1]

Previously asked in: 2024 31/5/1 Q25

◆ **Light – Reflection and Refraction** Converging action of a convex lens and concentration of parallel rays Principal Focus of a convex lens and the bright spot as the image of the Sun

Q34. § 9.3.3 Refraction by Spherical Lenses § 9.3.4 Image Formation by Lenses § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[1]**

How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper ?

(A) The size of the image formed will be one-half of the size of the image due to complete lens.
(B) The image of upper half of the object will not be formed.
(C) The brightness of the image will reduce.
(D) The lower half of the inverted image will not be formed.

Previously asked in: 2024 31/5/1 Q11

◆ **Light – Reflection and Refraction** Effect of covering part of a convex lens on image formation

Q35. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[2]**

A ray of light after refraction from a convex lens emerges parallel to its principal axis.
(i) Draw a labelled ray diagram to show it.
(ii) In this case, the incident ray before refraction from the lens passes through a point on its principal axis. Name the point.

Previously asked in: 2025 31/2/1 Q25 (b)

◆ **Light – Reflection and Refraction** Principal focus (F1) of a convex lens Ray diagrams for image formation by convex lens Refraction through a convex lens – ray parallel to principal axis after refraction

Q36. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[2]**

Out of the two lenses, one concave and the other convex, state which one will diverge a parallel beam of light falling on it. Draw a ray diagram to show the principal focus of the lens.

Previously asked in: 2025 31/2/1 Q25 (a)

◆ **Light – Reflection and Refraction** Concave lens – divergence of parallel beam and principal focus

Q37. § 9.3.1 Refraction through a Rectangular Glass Slab § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[5]**

Answer the following :

(i) Draw a ray diagram to show the refraction of a ray of light through a rectangular glass slab when it falls obliquely from air into glass. [2]

(ii) State Snell's law of refraction of light. [1]

(iii) Differentiate between the virtual images formed by a convex lens and a concave lens on the basis of : (I) object distance, and (II) magnification. [2]

Previously asked in: 2025 31/1/1 Q36(b)

◆ **Light – Reflection and Refraction** Refraction through a rectangular glass slab and lateral displacement Snell's Law of Refraction Virtual images formed by convex and concave lenses – comparison

Q38. § 9.2.1 Image Formation by Spherical Mirrors | § 9.3.5 Image Formation in Lenses Using Ray Diagrams | § 9.3.8 Power of a Lens **[1]**

Rays from the sun converge at a point 25 cm behind a convex lens. The distance at which an object be placed in front of the lens to get a virtual image, is :

(A) 20 cm
(B) 40 cm
(C) 50 cm
(D) More than 50 cm

Previously asked in: 2026 31/5/1 Q30

◆ **Light – Reflection and Refraction** | Focal length from parallel rays (sun rays) and virtual image formation by convex lens

Q39. § 9.2.1 Image Formation by Spherical Mirrors | § 9.3.5 Image Formation in Lenses Using Ray Diagrams | § 9.3.6 Sign Convention for Spherical Lenses **[3]**

Answer the following:

(a) Complete the following ray diagram to show the formation of image :

(b) Mention the nature, position and size of the image formed in this case.

(c) State the sign of the image distance in this case using the Cartesian sign convention.

Previously asked in: 2023 31/1/1 Q30

◆ **Light – Reflection and Refraction** | Cartesian sign convention for image distance | Nature, position and size of image formed by a lens/mirror | Ray diagram for image formation by a lens/mirror

Q40. § 9.3.5 Image Formation in Lenses Using Ray Diagrams | § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[5]**

An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 15 cm. Use lens formula to determine the distance of the image from the optical centre of the lens.

Previously asked in: 2024 31/2/1 Q36(b)

◆ **Light – Reflection and Refraction** | Lens Formula and Image Distance for Concave Lens

Q41. § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[3]**

A convex lens can form a (i) real, inverted and magnified image as well as (ii) virtual, erect and magnified image of an object. If the focal length of the lens is 10 cm, what should be the range of the object distance in both cases ? Draw ray diagrams to justify your answer.

Previously asked in: 2023 31/5/1 Q30 (b)

◆ **Light – Reflection and Refraction** | Image formation by a convex lens – real, inverted and magnified image | Image formation by a convex lens – virtual, erect and magnified image | Lens formula and sign convention | Ray diagrams for convex lens image formation

Q42. § 9.3.1 Refraction through a Rectangular Glass Slab § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[5]**

Answer the following :

(i) "In refraction of light through a rectangular glass slab, the emergent ray is always parallel to the direction of the incident ray." Why ? Explain with the help of a ray diagram. What happens when a ray of light falls normally on one of the faces of a rectangular glass prism ? Draw diagram. [3]

(ii) An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 20 cm. Use Lens formula to determine the position of the image formed in this case. [2]

Previously asked in: 2025 31/3/1 Q36(a)

◆ **Light – Reflection and Refraction** Lens formula application – image position using concave lens
Normal incidence on a face of a rectangular glass prism – no refraction/straight-through ray
Refraction through a rectangular glass slab – lateral displacement and emergent ray parallel to incident ray

Q43. § 9.3.4 Image Formation by Lenses § 9.3.5 Image Formation in Lenses Using Ray Diagrams § 9.3.6 Sign Convention for Spherical Lenses **[2]**

An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm. Use lens formula to find the position of the image formed in this case.

Previously asked in: 2025 31/1/1 Q24

◆ **Light – Reflection and Refraction** Lens Formula Application – Concave Lens

Q44. § 9.3.6 Sign Convention for Spherical Lenses § 9.3.7 Lens Formula and Magnification **[4]**

> Observation table for a convex lens:
> S.No. | Object distance (u) cm | Image distance (v) cm
> 1 | −150 | +30
> 2 | −75 | +37.5
> 3 | −50 | +50
> 4 | −37.5 | +75
> 5 | −30 | +150
> 6 | −15 | +37.5

The variation of image distance (v) with the object distance (u) for a convex lens is given in the following observation table. Analyse it and answer the questions given below :

(a) Without calculation, find out the focal length of the given convex lens. Justify your answer. [1]

(b) Which one of the observations given in the table is not correct and why ? [1]

(c) Find out the value of magnification for u = −30 cm. Write the nature of the image formed. Give reason for your answer. [2]

Previously asked in: 2026 31/3/1 Q38

◆ **Light – Reflection and Refraction** Convex lens – image distance vs object distance analysis Focal length of a convex lens from u-v data
Lens formula and image formation rules for convex lens Magnification produced by a convex lens

Q45. § 9.2.1 Image Formation by Spherical Mirrors **[4]**

> Table showing focal length of three concave mirrors A, B and C and the respective object distances.

Study the data given below showing the focal length of three concave mirrors A, B and C and the respective distances of objects placed in front of the mirrors :

(i) In which one of the above cases the mirror will form a diminished image of the object ? Justify your answer. [1]

(ii) List two properties of the image formed in case 2. [1]

(iii) What is the nature and size of the image formed by mirror C ? Draw ray diagram to justify your answer. [2]

Previously asked in: 2024 31/1/1 Q39

◆ **Light – Reflection and Refraction**
Image formation by concave mirror – effect of object distance relative to focal length and centre of curvature
Mirror formula and magnification concepts for concave mirrors | Ray diagram for concave mirror

Q46. § 9.3.4 Image Formation by Lenses **[3]**

> Observation table recording distance of flame from the lens and distance of the image from the lens.

A student placed a candle flame at different distances from a convex lens and focused its image on a screen. He recorded his observation in tabular form as given below :
Analyse the observation table and on the basis of your analysis only, answer the following questions (without doing any calculations) :
(a) What is the focal length of the convex lens used ? Give reason to justify your answer.
(b) Which one of the sets of observations is not correct and why ?
(c) Draw ray diagram to show image formation for any correct set of observation.

(a) What is the focal length of the convex lens used ? Give reason to justify your answer.

(b) Which one of the sets of observations is not correct and why ?

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Previously asked in: 2025 31/6/1 Q31

◆ **Light – Reflection and Refraction** | Convex lens – image formation at various object distances
Focal length determination from lens observations | Identifying incorrect observations using lens rules
Ray diagrams for image formation by a convex lens

Q47. § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[5]**

Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of a convex lens and answer the questions that follow without doing any calculations :

(a) Determine the focal length of the lens. Give reason for your answer.

(b) Find magnification of the image formed in Observation No. 3.

(c) The numerical value of magnifications in cases of observation 1 and 2 is same. List two differences in the images formed in these two cases.

Previously asked in: 2025 31/5/1 Q36 (B)

◆ **Light – Reflection and Refraction** | Convex lens – image distance vs object distance (observation table) | Focal length of a convex lens
Magnification by a convex lens (m = v/u) | Nature and characteristics of images formed by a convex lens

Q48. § 9.2.4 Mirror Formula and Magnification § 9.3.7 Lens Formula and Magnification **[3]**

If we want to obtain a virtual and magnified image of an object by using a concave mirror of focal length 18 cm, where should the object be placed? Use mirror formula to determine the object distance for an image of magnification +2 produced by this mirror to justify your answer.

Previously asked in: 2025 31/4/1 Q31

◆ **Light – Reflection and Refraction** Concave mirror – virtual and magnified image formation Mirror formula and magnification

Q49. § 9.3.7 Lens Formula and Magnification **[3]**

Answer the following :

(i) An object of 5 cm height is placed at a distance of 20 cm from the optical centre of a concave lens of focal length 18 cm. Calculate (1) image distance and (2) the magnification in this case.

(ii) Compare the values of magnification obtained by a concave lens and a convex lens when both the lenses form virtual images.

Previously asked in: 2023 31/5/1 Q30 (a)

◆ **Light – Reflection and Refraction** Lens formula and image distance calculation (concave lens) Magnification produced by a lens Nature and characteristics of images formed by concave and convex lenses

Q50. § 9.3.6 Sign Convention for Spherical Lenses § 9.3.7 Lens Formula and Magnification **[3]**

(B) An object of height 10 cm is placed 25 cm away from the optical centre of a converging lens of focal length 15 cm. Calculate the image-distance and height of the image formed.

Previously asked in: 2023 31/4/1 Q30 (B)

◆ **Light – Reflection and Refraction** Lens Formula and Magnification (Converging Lens)

Q51. § 9.3.4 Image Formation by Lenses § 9.3.7 Lens Formula and Magnification **[5]**

Answer the following:

(a) An object is placed in front of a convex lens of focal length f. If the distance of the object from the lens is 2f, draw a ray diagram to show the formation of the image. Write the value of magnification in this case.

(b) A student has focussed the image of a candle flame on a white screen using a convex lens. The situation is as given below : Length of the flame = 2 cm Focal length of the lens = 12 cm Distance of the flame from the lens = 16 cm If the flame is perpendicular to the principal axis of the lens, calculate the values of the following : (i) Distance of the image from the lens (ii) Length of the image formed

Previously asked in: 2023 31/2/1 Q36

◆ **Light – Reflection and Refraction** Lens formula and magnification calculations Refraction through a convex lens – ray diagram and image formation

Q52. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.4 Mirror Formula and Magnification **[3]**

(a) A student has focussed the image of an object of height 3 cm on a white screen using a concave mirror of focal length 12 cm. If the distance of the object from the mirror is 18 cm, find the values of the following :

(i) Distance of the image from the mirror

(ii) Height of the image

Previously asked in: 2023 31/2/1 Q31 (a)

◆ **Light – Reflection and Refraction** Magnification and image height calculation (concave mirror) Mirror formula and image distance calculation (concave mirror)

Q53. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[5]**

(i) Define principal axis of a lens. Draw a ray diagram to show what happens when a ray of light parallel to the principal axis of a concave lens passes through it.
(ii) The focal length of a concave lens is 20 cm. At what distance from the lens should a 5 cm tall object be placed so that its image is formed at a distance of 15 cm from the lens ? Also calculate the size of the image formed.

Previously asked in: 2024 31/4/1 Q36 (b)

◆ **Light – Reflection and Refraction** | Lens formula and magnification – concave lens numerical | Principal axis of a lens – definition | Ray diagram for concave (diverging) lens – ray parallel to principal axis

Q54. § 9.2.4 Mirror Formula and Magnification | § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[5]**

The variation of image distance (v) with object distance (u) for a convex lens is given in the following observation table. Analyse it and answer the questions that follow :
(i) Without calculation, find the focal length of the convex lens. Justify your answer.
(ii) Which observation is not correct ? Why ? Draw ray diagram to find the position of the image formed for this position of the object.
(iii) Find the approximate value of magnification for u = −30 cm.

Previously asked in: 2024 31/4/1 Q36 (a)

◆ **Light – Reflection and Refraction** | Convex lens – image distance vs object distance analysis | Lens formula and magnification | Ray diagrams for image formation by a convex lens

Q55. § 9.3.4 Image Formation by Lenses **[3]**

A convex lens forms an 80 cm long image of a 20 cm long object which is kept at a distance of 60 cm from the optical centre of the lens. If the object and the image are on the same side of the lens, find (i) the nature of the image, (ii) the position of the image, and (iii) the focal length of the lens.

Previously asked in: 2025 31/2/1 Q31

◆ **Light – Reflection and Refraction** | Convex lens – image formation and magnification | Lens formula and focal length calculation | Virtual and erect image formed by a convex lens

Q56. § 9.3.7 Lens Formula and Magnification **[3]**

Answer the following :

(a) Write the expression for the magnification produced by a lens in terms of object distance and image distance.

(b) A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. Calculate the size of the image formed, if the distance of the object from the lens is 10 cm.

Previously asked in: 2026 31/2/1 Q35

◆ **Light – Reflection and Refraction** | Image formation by a convex lens using lens formula and magnification | Magnification produced by a lens (formula in terms of object and image distance)

Q57. § 9.3.6 Sign Convention for Spherical Lenses **[1]**

From the following options choose the one which gives negative magnification greater than one :

(A) Concave mirror; Nature of image – real
(B) Concave mirror; Nature of image – virtual
(C) Convex mirror; Nature of image – real
(D) Convex mirror; Nature of image – virtual

Previously asked in: 2026 31/2/1 Q30

◆ **Light – Reflection and Refraction** | Magnification by mirrors and lenses – sign and magnitude

Q58. § 9.3.8 Power of a Lens **[4]**

> Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. The net power (P) of the lenses placed in contact is given by the algebraic sum of the powers of the individual lenses P1, P2, P3 ...
> P = P1 + P2 + P3 ...
> This is also termed as the simple additive property of the power of lens, widely used to design lens systems of cameras, microscopes and telescopes. These lens systems can have a combination of convex lenses and also concave lenses.

Read the case carefully and answer the questions that follow.

(a) What is the nature (convergent / divergent) of the combination of a convex lens of power + 4 D and a concave lens of power −2 D ? [1]

(b) Calculate the focal length of a lens of power −2·5 D. [1]

(c) Draw a ray diagram to show the nature and position of an image formed by a convex lens of power + 0·1 D, when an object is placed at a distance of 20 cm from its optical centre. [2]

Previously asked in: 2023 31/5/1 Q39

◆ **Light – Reflection and Refraction** | Power of a lens and combination of lenses | Ray diagram for image formation by a convex lens

Q59. § 9.3.7 Lens Formula and Magnification | § 9.3.8 Power of a Lens **[3]**

The power of a lens is +4D. Find the focal length of this lens. An object is placed at a distance of 50 cm from the optical centre of this lens. State the nature and magnification of the image formed by the lens and also draw a ray diagram to justify your answer.

Previously asked in: 2023 31/4/1 Q31

◆ **Light – Reflection and Refraction** | Image formation by a convex lens – nature and magnification | Power of a lens and focal length | Ray diagram for image formation by a convex lens

Q60. § 9.3.6 Sign Convention for Spherical Lenses | § 9.3.7 Lens Formula and Magnification **[3]**

(b) Define power of a lens. The focal length of a lens is −10 cm. Write the nature of the lens and find its power. If an object is placed at a distance of 20 cm from the optical centre of this lens, according to the New Cartesian Sign Convention, what will be the sign of magnification in this case ?

Previously asked in: 2023 31/2/1 Q31 (b)

◆ **Light – Reflection and Refraction** | Concave Lens – Nature and Focal Length | Power of a Lens | Sign of Magnification using New Cartesian Sign Convention

Q61. § 9.3.6 Sign Convention for Spherical Lenses § 9.3.7 Lens Formula and Magnification **[5]**

Answer the following :

(i) The power of a lens 'X' is – 2·5 D. Name the lens and determine its focal length in cm. For which eye defect of vision will an optician prescribe this type of lens as a corrective lens ? [2]

(ii) "The value of magnification 'm' for a lens is – 2." Using new Cartesian Sign Convention and considering that an object is placed at a distance of 20 cm from the optical centre of this lens, state : (I) the nature of the image formed; (II) size of the image compared to the size of the object; (III) position of the image, and (IV) sign of the height of the image. [2]

(iii) The numerical values of the focal lengths of two lenses A and B are 10 cm and 20 cm respectively. Which one of the two will show higher degree of convergence/divergence ? Give reason to justify your answer. [1]

Previously asked in: 2025 31/1/1 Q36(a)

◆ **Light – Reflection and Refraction** Concave (diverging) lens and myopia correction Lens formula (1/v - 1/u = 1/f) Magnification by lenses and image characteristics New Cartesian Sign Convention for lenses Power of a lens and focal length

Q62. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[4]**

> Lenses can form different types of images depending upon their focal length and position of object. A convex lens can create real, inverted or virtual, erect images, while a concave lens forms only virtual and diminished images. The focal length determines the power of lens. Convex lenses have positive focal length while concave lenses have negative focal length by convention. When lenses are placed together, their combined power is determined by the sum of their individual powers. Ray diagrams help to visualize how light converges or diverges through lens to form an image.

Read the following passage and answer the questions given :

(a) A convex lens of focal length 20 cm is used to form an image. If an object is placed at 40 cm from the lens, what will be the position and nature of image ? [1]

(b) Illustrate the formation of image with the help of ray diagram, when the object is placed between the optical centre and principal focus of concave lens. [1]

(c) A lens combination consists of a convex lens of focal length 30 cm and a concave lens of focal length 15 cm placed together. Find the equivalent focal length and power of this lens combination. [2]

Previously asked in: 2026 31/1/1 Q38

◆ **Light – Reflection and Refraction** Focal length and power of a lens Image formation by convex and concave lenses

Q63. § 9.3.1 Refraction through a Rectangular Glass Slab § 9.3.2 The Refractive Index **[2]**

State two laws of refraction of light.

Previously asked in: 2024 31/2/1 Q24(a)

◆ **Light – Reflection and Refraction** Laws of Refraction of Light

Q64. § 9.3.2 The Refractive Index **[2]**

A ray of light enters into medium B from medium A as shown in the given figure :

(a) Which one of these two media is optically denser than the other medium ? Justify your answer. [1]

(b) If the speed of light in medium A is VA and in medium B is VB, then what is the refractive index of medium B with respect to medium A ? [1]

Previously asked in: 2026 31/3/1 Q33

◆ **Light – Reflection and Refraction** Refraction of light – bending towards/away from normal and optical density Refractive index of one medium with respect to another (ratio of speeds of light)

Q65. § 9.1 REFLECTION OF LIGHT § 9.2.1 Image Formation by Spherical Mirrors § 9.2.2 Representation of Images Formed by Spherical Mirrors Using Ray Diagrams **[4]**

> A student took three concave mirrors of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these mirrors as shown in the following table.

Answer the sub-parts based on the experiment with three concave mirrors as given in the table.

(a) List two properties of the image formed in Case I.

(b) In which one of the cases given in the table, the mirror will form real image of same size and why ?

(c) Name the type of mirror used by dentists. Give reason why do they use such type of mirrors.

Previously asked in: 2023 31/6/1 Q39

◆ **Light – Reflection and Refraction** Image formation by concave mirror at various object distances Real image of same size – object at centre of curvature of concave mirror Uses of concave mirrors (dentist's mirror)

Q66. § 9.2.1 Image Formation by Spherical Mirrors **[4]**

> Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board held close to the mirror. Move the card-board back and forth gradually until you find a bright, sharp spot of light on the board. This spot of light is the image of the sun on the sheet of paper; which is also termed as "Principal Focus" of the concave mirror.

Read the passage and answer the following:

(a) List two applications of concave mirror. [1]

(b) If the distance between the mirror and the principal focus is 15 cm, find the radius of curvature of the mirror. [1]

(c) Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror. [2]

Previously asked in: 2023 31/1/1 Q39

◆ **Light – Reflection and Refraction** Applications of concave mirror Radius of curvature and focal length relationship (R = 2f) Ray diagram for concave mirror – object between pole and focus

Q67. § 9.3.5 Image Formation in Lenses Using Ray Diagrams **[3]**

(A) Define the following terms in the context of a diverging mirror :
(i) Principal focus
(ii) Focal length
Draw a labelled ray diagram to illustrate your answer.

Previously asked in: 2023 31/4/1 Q30 (A)

◆ **Light – Reflection and Refraction** Focal Length of a Diverging (Convex) Mirror Principal Focus of a Diverging (Convex) Mirror Ray Diagram for Convex (Diverging) Mirror

Q68. § 9.1 REFLECTION OF LIGHT § 9.2 SPHERICAL MIRRORS **[4]**

> A highly polished surface such as a mirror reflects most of the light falling on it. In our daily life we use two types of mirrors — plane and spherical. The reflecting surface of a spherical mirror may be curved inwards or outwards. In concave mirrors, reflection takes place from the inner surface, while in convex mirrors reflection takes place from the outer surface.

Answer the following questions :

(a) Define the principal axis of a concave mirror. [1]

(b) A ray of light is incident on a concave mirror, parallel to its principal axis. If this ray after reflection from the mirror passes through the principal axis from a point at a distance of 10 cm from the pole of the mirror, find the radius of curvature of the mirror. [1]

(c) Answer either (i) or (ii): [2]

Previously asked in: 2024 31/5/1 Q39

♦ **Light – Reflection and Refraction** Focal length and radius of curvature of a concave mirror Principal axis of a concave mirror Reflection of light from concave mirrors – ray diagrams

Q69. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.4 Mirror Formula and Magnification **[1]**

An object is placed at a distance of 30 cm from the pole of a concave mirror. If its real and inverted image is formed at 60 cm in front of the mirror, the focal length of the mirror is :

(A) – 15 cm
(B) – 20 cm
(C) + 20 cm
(D) + 15 cm

Previously asked in: 2025 31/2/1 Q12

♦ **Light – Reflection and Refraction** Mirror Formula and Focal Length of Concave Mirror

Q70. § 9.2.1 Image Formation by Spherical Mirrors § 9.2.4 Mirror Formula and Magnification § 9.3.7 Lens Formula and Magnification **[3]**

Answer the following:

(a) A ray of light after reflection from a concave mirror becomes parallel to its principal axis. Draw a labelled ray diagram to show this.

(b) (i) Differentiate between the virtual images formed by a convex mirror and concave mirror. (ii) "The value of magnification 'm' for a mirror is –2." Calculate the height of object if the height of image is 20 cm.

Previously asked in: 2026 31/5/1 Q36

♦ **Light – Reflection and Refraction** Mirror Formula and Magnification – Calculation of object/image height Reflection from Concave Mirror – Ray Diagram (ray parallel to principal axis after reflection) Virtual Images formed by Convex Mirror vs Concave Mirror – Comparison

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