NCERT Archive

SOLUTIONS BOOK

CLASS 8

Science · Curiosity

CHAPTER 10

Light: Mirrors and Lenses

Complete In-text Questions, Exercises and Activities Solutions

In-text Questions | Exercises | Discover, Design and Debate

Contents

Class 8 Science · Curiosity · Chapter 10 — Light: Mirrors and Lenses

10.1 **In-text Questions**
15 questions · Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 — 3

10.2 **Exercises**
12 questions · Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 — 17

10.3 **Discover, Design and Debate**
3 questions · Q1 Q2 Q3 — 28

Every question is followed by its answer. Question numbers above are clickable and the PDF bookmarks panel lets you jump to any exercise set or question. Figures are reproduced from the NCERT textbook (© NCERT) for educational use.

NCERT ARCHIVE

10.1

CLASS 8 SCIENCE · CHAPTER 10

In-text Questions

Solutions · 15 questions

Directions (Questions 1–15): These are the questions, activities and prompts that appear inside the chapter (Probe and Ponder, Activities 10.1 to 10.11 and the questions asked by the characters), numbered in the order in which they appear. Many are observation-based; model answers based on the chapter are given, and you may add examples from your own surroundings.

QUESTION 1 *Probe and Ponder · p. 152*

Can we make mirrors which can give enlarged or diminished images? On side-view mirrors of vehicles, there is a warning that says “Objects in mirror are closer than they appear”. Why is this warning written there? Why is there a curved line on some reading glasses?

ANSWER

These three questions preview the chapter. Each one can be answered with what spherical mirrors and lenses do to images.

a Mirrors giving enlarged or diminished images

- **Yes.** A **concave mirror** gives an **enlarged** (erect) image when the object is placed close to it.
- A **convex mirror** always gives an **erect and diminished** image.

b Warning on side-view mirrors

- Side-view mirrors of vehicles are **convex mirrors**. They always form an erect image that is **smaller** than the actual vehicle.
- Because the image is smaller, a vehicle behind looks farther away than it really is, so a driver may misjudge the distance.
- Hence the warning “Objects in mirror are closer than they appear”. (A convex mirror is still used because it shows a much wider area of the road behind.)

NCERT ARCHIVE

c Curved line on some reading glasses

Such glasses have two lens portions (bifocal lenses) and the curved line is the boundary between them. The portion used for reading small print is a convex lens, which makes the letters look larger; the other portion is used for seeing distant objects. (Model answer; the chapter returns to lenses in Section 10.4.)

Therefore, concave mirrors can enlarge and convex mirrors diminish; the warning exists because a convex side-view mirror makes vehicles look smaller and farther away.

QUESTION 2 *Activity 10.1 · p. 153*

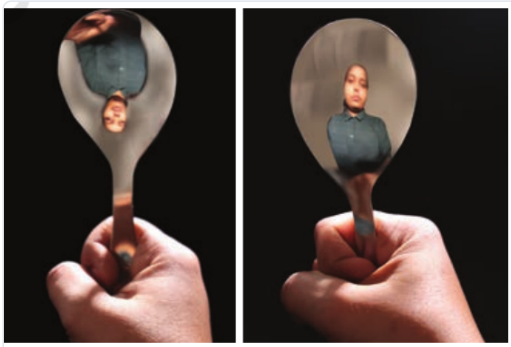
Take a shiny metallic spoon and hold its curved surface close to your face. Can you see your image in it? Notice the image of your face. Is it different from the image you see in a plane mirror? While observing the image, slowly move the spoon away from your face. Do you observe any change in the image? Now flip the spoon and repeat the same steps.

ANSWER

A shiny spoon has two curved surfaces: one curves inwards and the other bulges outwards. Each behaves like a different curved mirror.

a Can you see your image? Is it different?

Yes, the shiny spoon acts like a mirror. Its image is different from that in a plane mirror, which is always erect and of the same size as the object.



(a) (b)

Fig. 10.1: Image formed in a shiny metallic spoon from its (a) Inner curved surface; (b) Outer curved surface

NCERT ARCHIVE

b Observations on both sides of the spoon

Side of the spoon	Acts as	Image of the face	On moving the spoon away
Inner side (curves inwards)	Concave mirror	Inverted (Fig. 10.1a)	Size changes; very close it is erect and larger, farther away it is inverted and gets smaller
Outer side (bulges outwards)	Convex mirror	Erect and smaller (Fig. 10.1b)	Stays erect; becomes slightly smaller
Plane mirror (for comparison)	—	Erect, same size as the object	Remains erect and of the same size

Therefore, a shiny spoon forms images like curved mirrors: inverted from the inner (concave) side and erect and smaller from the outer (convex) side.

QUESTION 3 *Activity 10.2 · p. 155*

Place concave and convex mirrors on a table with their reflecting surfaces facing upwards. Now view them from the side, keeping your eye at their level, to identify whether the reflecting surface is curved inwards or outwards (Fig. 10.4). How can we distinguish between concave and convex mirrors?

ANSWER

The two mirrors differ in the way their reflecting surface is curved, and this can be seen from the side.

a Distinguishing by the side view

- **Concave mirror:** the reflecting surface is curved **inwards**; the middle is sunk in compared with the edges.
- **Convex mirror:** the reflecting surface is curved **outwards**; the middle bulges up compared with the edges.

b Distinguishing by the image

Mirrors can also be identified from the image of an object: a plane mirror gives an erect image of the same size, a convex mirror an erect and smaller image, and a concave mirror an enlarged image for a nearby object (Activity 10.3).

NCERT ARCHIVE

Therefore, a surface curved inwards is a concave mirror and a surface curved outwards is a convex mirror.

QUESTION 4 *Activity 10.3 · p. 155*

Take a concave mirror, a convex mirror, two small wooden blocks and a small toy. Place the two mirrors side by side in an upright position, with the object 3–4 cm away. What kind of images do you see in each mirror? Are the images of the same size as the object? Are they erect? Do you see lateral inversion in the images? Now slowly move the object away from the mirrors. What changes do you see in the images? Do the images become smaller or larger? Do they continue to be erect? Analyse your observations and draw conclusions.

ANSWER

Observations are noted for the object kept close to the mirror and then moved far away. The plane mirror is included for comparison.

a Observations

Observation	Plane mirror	Concave mirror	Convex mirror
Object close (3–4 cm)	Erect, same size	Erect, enlarged	Erect, diminished
Object moved far away	Erect, same size	Inverted; first enlarged, then smaller	Erect, diminished; size decreases slightly
Lateral inversion	Seen	Seen	Seen

b Conclusions

- A plane mirror always forms an erect image of the same size as the object.
- In concave and convex mirrors the size of the image changes as the distance of the object changes.
- A concave mirror also gives an inverted image when the object is taken away from it; a convex mirror always gives an erect, diminished image.
- Lateral inversion is seen in all three types of mirrors.

Therefore, plane, concave and convex mirrors can be told apart by the size and orientation of the images they form.

NCERT ARCHIVE

QUESTION 5 *Text question · p. 156*

Where do we find concave and convex mirrors being used in our surroundings?

ANSWER

Concave and convex mirrors are used in many everyday devices.

a Uses of concave and convex mirrors

Mirror and where it is used	Reason
Concave – dental mirror	Gives an enlarged view of teeth when held close to them
Concave – reflectors of torches; headlights of cars and scooters	The reflectors are concave in shape
Concave – main mirror of a reflecting telescope	A large concave mirror is used as the main mirror
Convex – side-view mirror of vehicles	Erect image of the traffic behind, smaller than the vehicles, and a much wider area of the road
Convex – road safety mirror at intersections and sharp bends	Drivers from both sides can see the other side, which prevents collisions
Convex – surveillance mirror in big stores	Monitors a large area to deter thefts

Therefore, concave mirrors are used where an enlarged image or a reflector is needed, and convex mirrors where a wide field of view is needed.

NCERT ARCHIVE

QUESTION 6 *Activity 10.4 · pp. 157–158*

Using a thin slit and a torch, obtain a thin beam of light and let it fall on a plane mirror at one angle and then at a different angle. Does the reflected beam of light also shift? Observe how the direction of the reflected beam changes. Draw the incident ray, the reflected ray and the normal, measure the angle of incidence and the angle of reflection and note them in Table 10.1. Repeat several times. Finally, let the incident beam fall on the mirror along the normal. What would be the angle of incidence and angle of reflection in this case?

ANSWER

This activity leads to the first law of reflection by comparing the angle of incidence with the angle of reflection.

a Does the reflected beam shift?

Yes. When the incident beam falls at a different angle, the reflected beam also shifts to a different direction.

b Terms used in the drawing

- **Incident ray:** the ray that falls on the mirror; **reflected ray:** the ray that comes back from the mirror.
- **Normal:** the line drawn at 90° to the mirror at the point of incidence, O.
- **Angle of incidence (i):** angle between the normal and the incident ray; **angle of reflection (r):** angle between the normal and the reflected ray.

c Table 10.1: Measuring angles of incidence and reflection

S.No.	Angle of incidence (i)	Angle of reflection (r)
1	20°	20°
2	30°	30°
3	45°	45°
4	60°	60°

These are model readings. In a careful experiment your measured values for i and r are nearly equal, with only small errors.

NCERT ARCHIVE

d Beam falling along the normal

Incident beam along the normal: i = 0°

Reflected beam: r = 0° (it returns along the same path)

Therefore, the angle of incidence is equal to the angle of reflection (i = r). This is a law of reflection.

QUESTION 7 *Activity 10.5 · p. 159*

Use the same setup as in Activity 10.4, but place a stiff sheet of chart paper flat on a table such that part of it extends beyond the edge of the table. Shine a beam of light on the mirror placed on the sheet and observe the reflected beam on the extended portion. Now bend the extended part of the sheet along the edge of the table. Do you still see the reflected beam on the extended portion? Flatten the paper again and observe.

ANSWER

Bending the paper changes the plane in which the reflected beam can be seen on the sheet.

a Observations

Condition of the sheet	Reflected beam on the extended portion
Flat sheet	Reflected beam is visible
Extended part bent along the table edge	Reflected beam disappears
Sheet flattened again	Reflected beam reappears

b Explanation

Bending the sheet creates a new plane and breaks the alignment. The beam can be seen only when the sheet lies in the same plane as the incident beam, so the reflected beam lies in the same plane as the incident beam.

Therefore, the incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane. This is another law of reflection.

NCERT ARCHIVE

QUESTION 8 *Activity 10.6 · p. 160*

Are laws of reflection applicable to spherical mirrors also? Let multiple parallel beams of light (many openings of the comb left uncovered) fall upon the plane mirror, the concave mirror and the convex mirror, one by one. Observe the reflected beams. Is your observation similar to what is shown in Fig. 10.11 (b), (c) and (d)?

ANSWER

Parallel beams of light are reflected differently by the three types of mirrors, even though every ray obeys the laws of reflection.

a Reflected beams from parallel beams

Mirror	Reflected beams	Term used
Plane mirror (Fig. 10.11b)	Also parallel	—
Concave mirror (Fig. 10.11c)	Get closer together	Converge
Convex mirror (Fig. 10.11d)	Spread out	Diverge

b Are the laws of reflection valid for spherical mirrors?

Yes. The laws of reflection are valid for all kinds of mirrors: plane and spherical. Each ray of light follows them, but the curved surface makes the parallel beam converge (concave) or diverge (convex).

Therefore, the laws of reflection apply to plane, concave and convex mirrors; a concave mirror converges a light beam and a convex mirror diverges it.

NCERT ARCHIVE

QUESTION 9 *Activity 10.7 · p. 161*

Since the concave mirror converges the light beam, wouldn't light get concentrated in a small area? Hold a concave mirror with its reflecting surface facing the Sun and direct the reflected sunlight on a sheet of thin paper or newspaper. Adjust the distance of the paper until you get a sharp bright spot. Hold the mirror and the paper steady for a few minutes. Does the paper start to burn producing smoke?

ANSWER

Safety first: perform this activity under the supervision of a teacher or an adult. Do not look at the Sun or into the mirror reflecting the Sun, and focus the light only on paper.

a Does the light get concentrated?

- **Yes.** The concave mirror converges the reflected sunlight to a sharp, bright spot on the paper.
- This concentration produces enough heat at that point, so the paper starts to burn and produces smoke.

b Application: solar concentrators

Devices that concentrate sunlight into a small area using mirrors and lenses are called solar concentrators. The heat is used to produce steam for electricity, for large-scale cooking and in solar furnaces, which can even melt steel. (The textbook also recalls electric furnaces from an earlier chapter; a solar furnace gets its heat from concentrated sunlight instead of electricity.)

Therefore, a concave mirror concentrates sunlight into a small bright spot whose heat can burn paper.

NCERT ARCHIVE

QUESTION 10 *Activity 10.8 · p. 162*

Spread a thin coating of oil or wax on a flat strip of glass or clear plastic and place a small drop of water on it. Examine the water drop. What is the shape of its surface? Is it flat or curved inward or curved outward? Place a paper with printed text underneath so that the text is directly under the drop and look down through the drop. Do you find some change in the size of the letters just below the water drop? Do they look enlarged or smaller?

ANSWER

Would objects look the same through a transparent material with a curved surface? A water drop helps us to find out.

a Observations

- The surface of the water drop is **curved outward** (it is not flat).
- The letters just below the drop look **enlarged**, larger than the letters nearby (Fig. 10.13).
- Through a flat window pane objects look the same size and shape, but a curved surface changes how they look.

b Conclusion: the water drop acts as a lens

The curved drop of water acts like a simple lens, just as a magnifying glass (Fig. 10.14) makes small print look bigger. A lens is a piece of transparent material, usually glass or plastic, with curved surfaces. A lens thicker at the middle than at the edges is a convex lens; one thicker at the edges is a concave lens.

Therefore, the outward-curved water drop magnifies the letters like a simple convex lens.

NCERT ARCHIVE

QUESTION 11 *Activity 10.9 · p. 163*

What changes can be seen in the objects when viewed through lenses? Place a small object behind a convex lens kept upright, look at it through the lens and note your observations. Slowly move the object farther from the lens. How does the distance of the object from the convex lens affect how it looks? Now repeat the steps using a concave lens. Analyse your observations and compare the images seen through both lenses. What conclusions do you draw?

ANSWER

Unlike mirrors, lenses allow light to pass through them, so we see things through a lens rather than in a lens.

a Observations

Object behind the lens	Convex lens	Concave lens
Small distance from the lens	Erect and enlarged	Erect and diminished
Distance increased	Inverted; first enlarged, then diminished	Always erect and diminished; size changes with distance

b Conclusions

- The image through a convex lens may be enlarged, diminished or of the same size, and erect or inverted, depending on the distance of the object.
- The image through a concave lens is always erect and diminished in size.

Therefore, a convex lens can enlarge and invert images depending on the distance, whereas a concave lens always gives an erect, diminished image.

NCERT ARCHIVE

QUESTION 12 *Activity 10.10 · p. 164*

Let multiple parallel beams of light fall upon a thin transparent glass plate, a convex lens and a concave lens one by one. Does the parallel beam of light pass through as it is in all three cases? Record and analyse your observations. Do lenses also converge or diverge the light beam?

ANSWER

The glass plate is used for comparison, since its surfaces are flat.

a Observations

Placed in the path of parallel beams	Emerging beams	Name of the lens
Thin transparent glass plate	Pass through as they are	—
Convex lens	Converge	Converging lens
Concave lens	Diverge	Diverging lens

Therefore, lenses also change the light beam: a convex lens converges it and a concave lens diverges it, unlike a flat glass plate.

QUESTION 13 *Activity 10.11 · p. 165*

Since convex lens converges a light beam, can it also burn a paper? Repeat Activity 10.7 by putting a convex lens in the path of sunrays in place of a concave mirror. Could you burn the paper?

ANSWER

Safety first: do not look at the Sun directly or through the lens as it may damage your eyes.

a Can a convex lens burn paper?

- **Yes.** A convex lens converges the sunlight into a small bright spot on the paper (Fig. 10.19).
- The concentrated light produces enough heat at that spot, so the paper can be burnt.

NCERT ARCHIVE

Therefore, a convex lens, like a concave mirror, can concentrate sunlight and burn a piece of paper.

QUESTION 14 *Text question · p. 165*

Where all are the lenses used?

ANSWER

Lenses are important and are used everywhere around us.

a **Uses of lenses**

- **Eyeglasses** that people wear to help them see clearly are lenses.
- **Cameras** (such as smartphone camera lenses), **telescopes** and **microscopes** all use lenses to work.
- **Our eye** has a convex lens inside it, which can change its shape; this lets us read a book or see something far away.

Therefore, lenses are used in eyeglasses, cameras, telescopes and microscopes, and our own eye contains a convex lens.

NCERT ARCHIVE

QUESTION 15 *Open-ended prompts · pp. 152, 168, 169*

Share your questions. Prepare some questions based on your learnings so far. Reflect on the questions framed by your friends and try to answer.

ANSWER

These are open-ended writing prompts, so every student’s answer will differ. Model questions with answers from the chapter are given below.

a Model questions and answers

Model question	Model answer
Why are convex mirrors used as side-view mirrors?	They form an erect, diminished image and give a much wider view of the road behind.
Which mirror gives an enlarged image?	A concave mirror, when the object is placed close to it.
Are the laws of reflection true for curved mirrors?	Yes, they are valid for plane, concave and convex mirrors.
Can a convex lens burn paper?	Yes, it converges sunlight to a bright spot whose heat can ignite the paper.

Therefore, good questions start from observations in this chapter and can be answered using the same activities.

NCERT ARCHIVE

10.2

CLASS 8 SCIENCE · CHAPTER 10

Exercises

Solutions · 12 questions

Directions (Questions 1–12): These are the end-of-chapter questions under ‘Keep the curiosity alive’, in their original numbering. The figures that the questions refer to are reproduced with the answers, and every answer is followed by a conclusion.

QUESTION 1 *Keep the curiosity alive · p. 166*

A light ray is incident on a mirror and gets reflected by it (Fig. 10.21). The angle made by the incident ray with the normal to the mirror is 40°. What is the angle made by the reflected ray with the mirror?
(i) 40° (ii) 50° (iii) 45° (iv) 60°

ANSWER

Use the law of reflection and the fact that the normal is at 90° to the mirror.

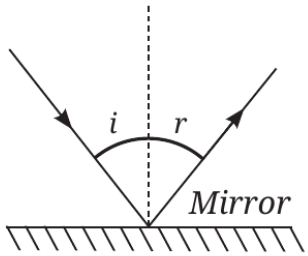


Fig. 10.21

a **Solution**

Angle of incidence i = 40°
Law of reflection: r = i = 40°
Normal is at 90° to the mirror, so angle with mirror = 90° − r
= 90° − 40° = 50°

Therefore, the reflected ray makes 50° with the mirror. Correct option: (ii).

NCERT ARCHIVE

QUESTION 2 *Keep the curiosity alive · p. 166*

Fig. 10.22 shows three different situations where a light ray falls on a mirror: (i) The light ray falls along the normal. (ii) The mirror is tilted, but the light ray still falls along the normal to the tilted surface. (iii) The mirror is tilted, and the light ray falls at an angle of 20° from the normal. Draw the reflected ray in each case (use a ruler and protractor for accurate drawing). What is the angle of reflection in each case?

ANSWER

In every case the reflected ray is drawn using the law of reflection: the angle of reflection is equal to the angle of incidence.

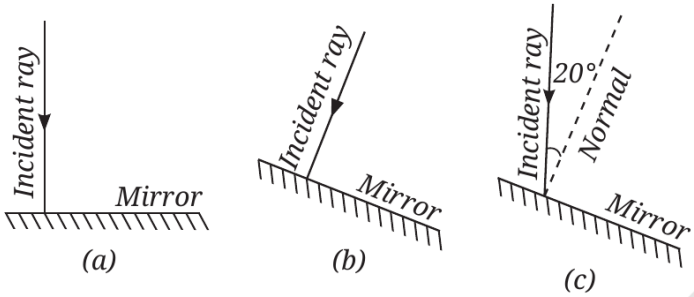
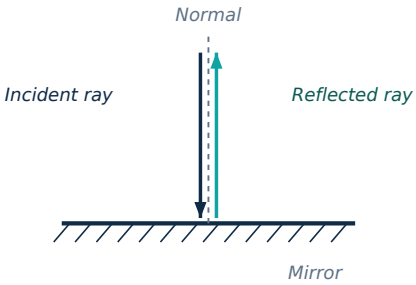


Fig. 10.22

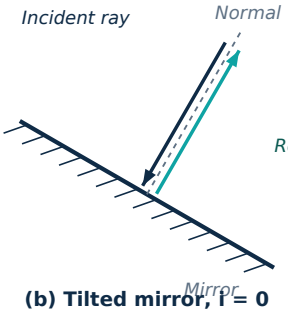
a Steps for drawing each reflected ray

- Mark the point of incidence O and draw the normal at O, making 90° with the mirror.
- Measure the angle of incidence i between the incident ray and the normal with a protractor.
- On the other side of the normal, draw a line making an angle r = i with the normal and put an arrow on it. This is the reflected ray.

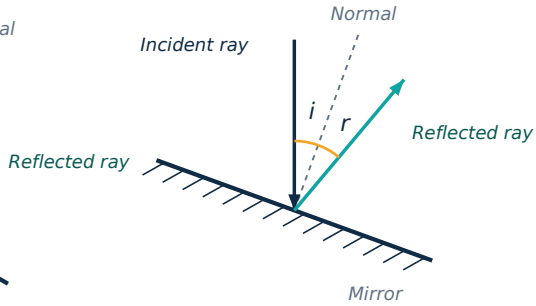
b Reflected rays (drawn)



(a) Ray along the normal
i = 0°, r = 0°



(b) Tilted mirror, i = 0
i = 0°, r = 0°



(c) Tilted mirror, i = 20°
i = 20°, r = 20°

NCERT ARCHIVE

c Angle of reflection in each case

Case	i	r	Reflected ray
(a) Ray along the normal	0°	0°	Returns along the normal, back along the incident path
(b) Tilted mirror, ray along its normal	0°	0°	Returns along the normal of the tilted mirror
(c) Tilted mirror, i = 20°	20°	20°	On the other side of the normal, at 20° to it

Therefore, the angle of reflection is 0° in (a) and (b) and 20° in (c), equal to the angle of incidence each time.

QUESTION 3 *Keep the curiosity alive · p. 166*

In Fig. 10.23, the cap of a sketch pen is placed in front of three types of mirrors. Match each image with the correct mirror: (i) Plane mirror, (ii) Convex mirror, (iii) Concave mirror.

ANSWER

Compare the size of the image of the cap with the size of the cap itself.



(i) (ii) (iii)

Fig. 10.23

a Matching

Image	Mirror	Reason
(i)	Convex mirror	Image is erect and smaller (diminished) than the cap
(ii)	Concave mirror	Image is erect and larger (enlarged) than the cap
(iii)	Plane mirror	Image is erect and of the same size as the cap

© NCERT not to be republished
NCERT ARCHIVE

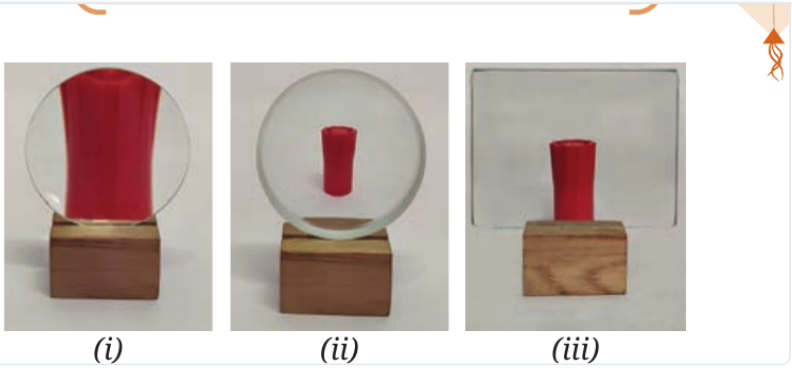
Therefore, (i) is a convex mirror, (ii) is a concave mirror and (iii) is a plane mirror.

QUESTION 4 *Keep the curiosity alive · p. 167*

In Fig. 10.24, the cap of a sketch pen is placed behind a convex lens, a concave lens, and a flat transparent glass piece, all at the same distance. Match each image with the correct type of lens or glass: (i) Flat transparent glass piece, (ii) Convex lens, (iii) Concave lens.

ANSWER

Objects seen through a flat glass piece keep their size; a convex lens enlarges a nearby object and a concave lens diminishes it.



a Matching

Image	Lens / glass	Reason
(i)	Convex lens	The cap looks erect and enlarged
(ii)	Concave lens	The cap looks erect and diminished
(iii)	Flat transparent glass piece	The cap looks of the same size as it is

Therefore, (i) is a convex lens, (ii) is a concave lens and (iii) is the flat transparent glass piece.

NCERT ARCHIVE

QUESTION 5 *Keep the curiosity alive · p. 167*

When the light is incident along the normal on the mirror, which of the following statements is true:
(i) Angle of incidence is 90° (ii) Angle of incidence is 0° (iii) Angle of reflection is 90° (iv) No reflection of light takes place in this case

ANSWER

The angle of incidence is measured from the normal, not from the mirror surface.

a **Solution**

- A ray falling along the normal makes **0°** with the normal, so the angle of incidence is 0°.
- By the law of reflection the angle of reflection is also 0°; the ray is reflected back along its own path.
- So (i) and (iii) are wrong (90° is the angle with the mirror), and (iv) is wrong because reflection does take place.

Therefore, the correct statement is (ii): the angle of incidence is 0°.

QUESTION 6 *Keep the curiosity alive · p. 167*

Three mirrors — plane, concave and convex — are placed in Fig. 10.25. On the basis of the images of the graph sheet formed in the mirrors, identify the mirrors and write their names above the mirrors.

ANSWER

Compare the size and shape of the graph lines in each mirror with the graph sheet itself.

NCERT ARCHIVE

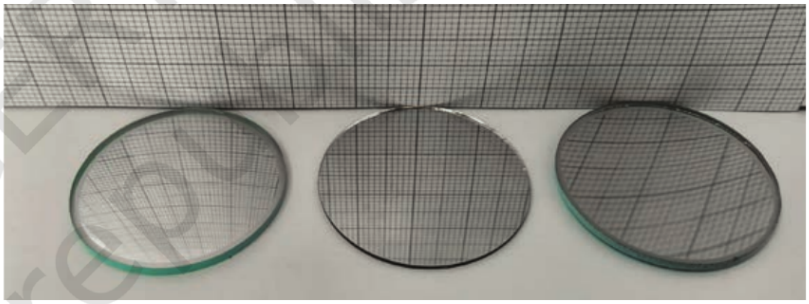


Fig. 10.25

a **Identification**

Mirror	Name	Reason
Left	Concave mirror	The graph lines look enlarged (larger squares) and curved
Middle	Plane mirror	The graph lines are straight and of the same size as the sheet
Right	Convex mirror	The graph lines look diminished (smaller squares) and curved

Therefore, from left to right the mirrors are: concave, plane and convex.

QUESTION 7 *Keep the curiosity alive · p. 167*

In a museum, a woman walks towards a large concave mirror (Fig. 10.26). She will see that:
(i) her erect image keeps decreasing in size.
(ii) her inverted image keeps decreasing in size.
(iii) her inverted image keeps increasing in size and eventually it becomes erect and magnified.
(iv) her erect image keeps increasing in size.

ANSWER

In a concave mirror the image depends on the distance of the object from the mirror.

NCERT ARCHIVE

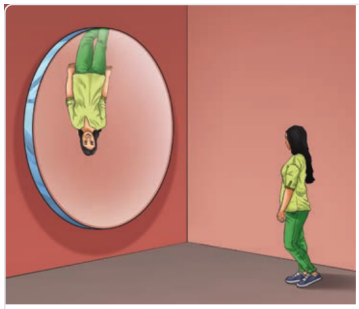


Fig. 10.26

a Solution

- When the woman is far from the concave mirror, her image is **inverted**.
- As she walks towards the mirror, the inverted image keeps **increasing in size**.
- When she is very close to the mirror, the image becomes **erect and enlarged** (magnified).
- Options (i), (ii) and (iv) do not describe this change.

Therefore, the correct option is (iii).

QUESTION 8 *Keep the curiosity alive · p. 167*

Hold a magnifying glass over text and identify the distance where you can see the text bigger than they are written. Now move it away from the text. What do you notice? Which type of lens is a magnifying glass?

ANSWER

A magnifying glass is used to read small print and works like the water drop of Activity 10.8.

a Observations

- Held **close to the text**, the letters look **erect and bigger** than they are written.
- On **moving the lens away** from the text, the image changes: it becomes inverted and then diminishes in size.

b Type of lens

A magnifying glass is thicker at the middle than at the edges, so it is a **convex lens**.

NCERT ARCHIVE

Therefore, a magnifying glass is a convex lens; it enlarges text held close to it and gives an inverted, diminished image at larger distances.

QUESTION 9 *Keep the curiosity alive · p. 168*

Match the entries in Column I with those in Column II.
(i) Concave mirror, (ii) Convex mirror, (iii) Convex lens, (iv) Concave lens
(a) Spherical mirror with a reflecting surface that curves inwards. (b) It forms an image which is always erect and diminished in size. (c) Object placed behind it may appear inverted at some distance. (d) Object placed behind it always appears diminished in size.

ANSWER

Match each device with its definition or property from the chapter.

a **Matching**

Column I	Match	Reason
(i) Concave mirror	(a)	A spherical mirror whose reflecting surface curves inwards
(ii) Convex mirror	(b)	Its image is always erect and diminished
(iii) Convex lens	(c)	An object behind it may appear inverted at some distance
(iv) Concave lens	(d)	An object behind it always appears diminished

Therefore, (i)–(a), (ii)–(b), (iii)–(c), (iv)–(d).

NCERT ARCHIVE

QUESTION 10 *Keep the curiosity alive · p. 168*

The following question is based on Assertion/Reason.
Assertion: Convex mirrors are preferred for observing the traffic behind us.
Reason: Convex mirrors provide a significantly larger view area than plane mirrors.
(i) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion. (ii) Both are correct but Reason is not the correct explanation. (iii) Assertion is correct but Reason is incorrect. (iv) Both are incorrect.

ANSWER

Check each statement separately and then see whether the Reason explains the Assertion.

a **Solution**

- **Assertion is correct:** side-view mirrors are convex, and they form an erect, smaller image of the traffic behind.
- **Reason is correct:** being curved outside, a convex mirror provides a much wider area of the road behind than a plane mirror.
- The wider view area is exactly why convex mirrors are preferred, so the Reason explains the Assertion.

Therefore, the correct option is (i).

NCERT ARCHIVE

QUESTION 11 *Keep the curiosity alive · p. 168*

In Fig. 10.27, note that O stands for object, M for mirror, and I for image. Which of the following statements is true?
(i) Figure (a) indicates a plane mirror and Figure (b) indicates a concave mirror.
(ii) Figure (a) indicates a convex mirror and Figure (b) indicates a concave mirror.
(iii) Figure (a) indicates a concave mirror and Figure (b) indicates a convex mirror.
(iv) Figure (a) indicates a plane mirror and Figure (b) indicates a convex mirror.

ANSWER

Compare the size of the image arrow I with the size of the object arrow O in each figure.

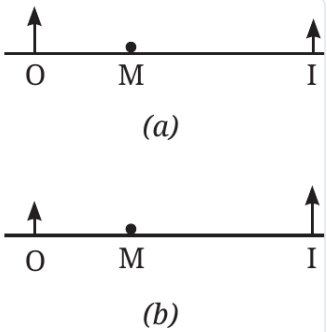


Fig. 10.27

a **Solution**

- **Figure (a):** the image is erect and of the same size as the object, so it is a **plane mirror**.
- **Figure (b):** the image is erect and larger than the object (enlarged), so it is a **concave mirror**. A convex mirror always gives a diminished image, so it cannot be a convex mirror.

Therefore, the correct option is (i).

NCERT ARCHIVE

QUESTION 12 *Keep the curiosity alive · p. 169*

Place a pencil behind a transparent glass tumbler (Fig. 10.28a). Now fill the tumbler halfway with water (Fig. 10.28b). How does the pencil appear when viewed through the water? Explain why its shape appears changed.

ANSWER

The water-filled part of the tumbler has a curved surface, like the water drop of Activity 10.8.



a Observation

The part of the pencil seen through the water appears **thicker (enlarged)** and looks different from the part above the water (Fig. 10.28b).

b Explanation

The curved surface of the water-filled glass makes the size of the object look different. It acts like a lens, just as the curved drop of water acted like a simple lens and made the letters look larger.

Therefore, the pencil looks changed in the water because the curved, transparent water-filled tumbler acts like a lens and enlarges it.

NCERT ARCHIVE

10.3

CLASS 8 SCIENCE · CHAPTER 10

Discover, Design and Debate

Solutions · 3 questions

Directions (Questions 1–3): These are the activity, project and simulation tasks under ‘Discover, design, and debate’. Many are open-ended; model answers based on the chapter are given.

QUESTION 1 *Discover, design, and debate · p. 169*

Visit a nearby hospital or the clinic of an ENT specialist, or a dentist, with your teacher or parents. Request the doctor to show you the mirrors used for examining ear, nose, throat, and teeth. Identify the kind of mirror used in these instruments.

ANSWER

This is an activity task. The model answer below gives what you are likely to find; confirm it with the doctor.

a Mirrors used

- **Dentist:** the dental mirror is a **concave mirror**. It gives an enlarged view of the teeth when held close to them inside the mouth.
- **ENT specialist:** a concave mirror (a head mirror) is used to focus light on the area examined, while the small mirror put in the throat is usually a plane mirror. Note down what your doctor shows you.

Therefore, dentists use a concave mirror to get an enlarged view of teeth; check with the ENT specialist the kind of each mirror used.

NCERT ARCHIVE

QUESTION 2 *Discover, design, and debate · p. 169*

Harnessing sunlight is key to solving future energy challenges. In devices like solar cookers (Fig. 10.29), mirrors are used to converge sunlight and generate heat. In India, such designs are used in villages, thus saving electricity and reducing fossil fuel use. Think of a design for a solar cooker for your school or home and prepare a detailed proposal for it including the budget required.

ANSWER

This is a project task. A model proposal is given; the costs are only indicative and should be changed to match local prices.

a Design idea

- Use a box-shaped frame with mirror strips (or a reflector panel) tilted towards the Sun, so that the mirrors **converge sunlight** on the cooking pot.
- Keep the pot (blackened) at the point where the light is concentrated and cover it with transparent glass.
- Mount the frame on a stand so it can be turned to face the Sun during the day.

b Indicative budget

Item	Approximate cost (₹)
Mirror strips / reflector panel	300
Wooden or metal frame	400
Cooking pot painted black	150
Transparent glass cover	150
Stand and hinges	100
Total	**1,100**

Therefore, a solar cooker uses mirrors to concentrate sunlight on a pot; the model design above costs about ₹1,100 and saves electricity and fuel.

NCERT ARCHIVE

QUESTION 3 *Discover, design, and debate · p. 169*

Use online tools or animation to do virtual experiments with spherical mirrors and lenses. Move objects in the simulation and observe how the image changes.

ANSWER

This is a simulation task. When you move the object in a simulation, you should observe the same results as in the activities of this chapter.

a What you should observe

Device	Object close	Object far away
Concave mirror	Erect and enlarged	Inverted; enlarged first, then smaller
Convex mirror	Erect and diminished	Erect, diminished; size decreases slightly
Convex lens	Erect and enlarged	Inverted; enlarged first, then smaller
Concave lens	Erect and diminished	Erect and diminished

Therefore, a simulation confirms that concave mirrors and convex lenses can enlarge and invert images while convex mirrors and concave lenses always diminish them.

NCERT ARCHIVE