Light: Mirrors and Lenses

10

Probe and ponder

- 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?
- Share your questions

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______________________________ ?

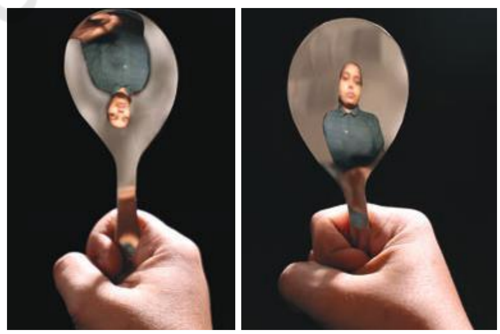
During the summer holidays, Meena went to a science centre with her family. The centre had many fascinating displays on nature, space, and technology. While her parents explored a section on saving water and electricity, Meena and her brother wandered off to look around. In one corner, Meena noticed a row of unusual, curved mirrors. Curious, she stepped closer and looked into one. Her face appeared unusually large, while her brother, standing a little farther away, looked upside down! At another mirror, she saw a tiny version of herself. Meena was puzzled.

She remembered doing activities with a mirror earlier where the image formed by the mirror was of the same size as the object and was erect (in the chapter 'Light: Shadows and Reflections' in *Curiosity*, Grade 7). Seeing her confusion, a guide from the science centre walked up to her and smiled. "These are not plane mirrors," the guide explained. "These are spherical mirrors. When the mirror is curved inward or outward, your image looks different in them!" Meena's curiosity grew and she decided to talk to her teacher about these spherical mirrors.

10.1 What Are Spherical Mirrors?

Activity 10.1: Let us explore

- 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.



(a) (b)

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

Did you notice that the shiny metallic spoon acted like a mirror and you could see your image in it? When you looked at the inner side of the spoon which is curved inwards, you must have observed that the image was inverted (Fig. 10.1a). When you looked at the outer side of the spoon which bulges outwards, the image of your face was erect but smaller in size (Fig. 10.1b).

Curved mirrors, like the spoon, can also be specially made. Spherical mirrors are a common type of curved mirrors which are shaped like a part of a hollow glass sphere. Mirrors, whose reflecting surfaces are spherical are called **spherical mirrors**.

The reflecting surface of the spherical mirror may be curved inwards or outwards. A spherical mirror, which has a reflecting surface that curves inwards, is called a **concave mirror** (Fig. 10.2a). Its schematic representation is shown in Fig. 10.2b. The outline of the surface of the mirror is circular.

(a) *(b)*

Fig. 10.2: (a) Concave mirror; (b) Its representation

(a) *(b)*

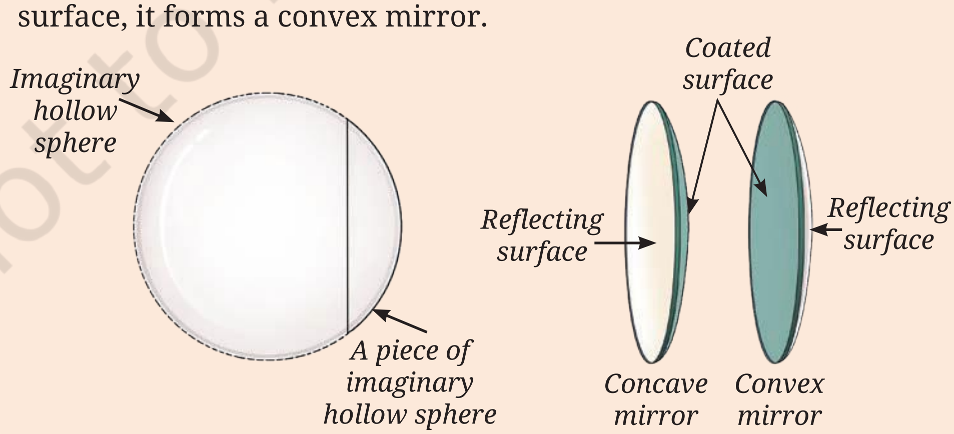
Fig. 10.3: (a) Convex mirror; (b) Its representation

A spherical mirror which has a reflecting surface that curves outwards is called a **convex mirror** (Fig. 10.3a). Its schematic representation is shown in Fig. 10.3b.

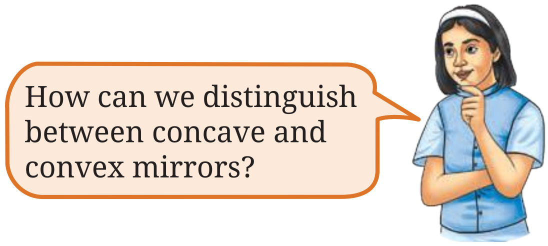
In the representation of both the mirrors, the non-reflecting surface of the mirror is shown as shaded.

A step further

The shape of a spherical mirror is such that it can be thought of as a part of an imaginary hollow sphere. However, remember that spherical mirrors are not made by slicing a hollow glass sphere. Instead, they are created by grinding and polishing a flat glass piece into a curved surface. If a reflective coating (like a thin layer of aluminium) is applied on the outer curved surface, it forms a concave mirror. If the coating is applied on the inner curved surface, it forms a convex mirror.



Activity 10.2: Let us distinguish



- 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).

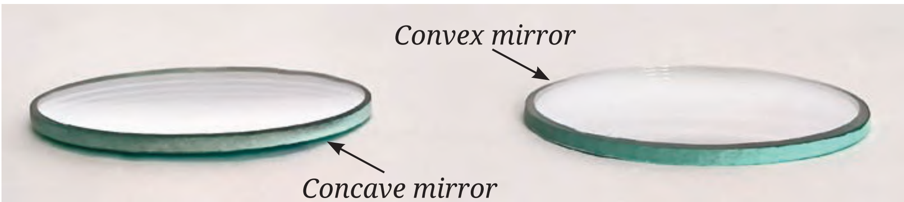


Fig. 10.4: Identifying concave and convex mirrors from their side view

10.2 What Are the Characteristics of Images Formed by Spherical Mirrors?

Activity 10.3: Let us explore

- Take a concave mirror, a convex mirror, two small wooden blocks or something similar to place the mirrors in an upright position, and a small toy or some other object.
- Place the two mirrors side by side in an upright position on a table. Keep the object in front of them at a small distance (3–4 cm away) as shown in Fig. 10.5a. 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? Write down your observations in your notebook.

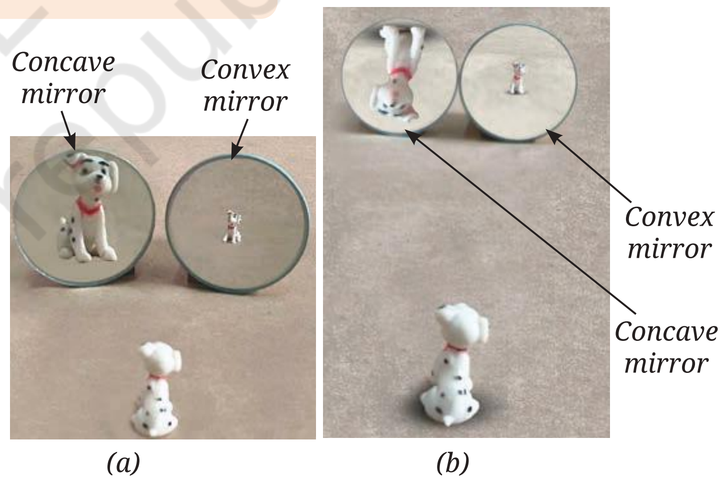


Fig. 10.5: An object placed in front of concave and convex mirrors at (a) Small distance; (b) Large distance

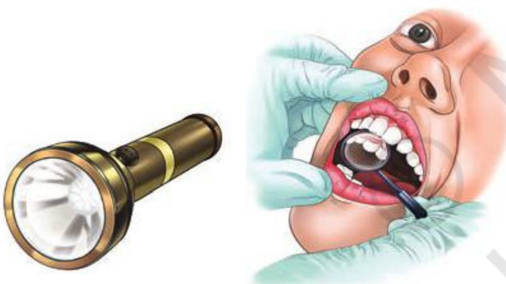
- Now slowly move the object away from the mirrors. What changes do you see in the images in both the mirrors? Do the images become smaller or larger? Do they continue to be erect? Again, note down your observations.
- Repeat the steps with each mirror individually.
- **Analyse** your observations and **draw conclusions**.

In the concave mirror, when the object is placed close to the mirror, the image is erect but larger than the object in size, that is, **enlarged**. However, when the object is moved farther away, the image becomes inverted. Initially, the image is enlarged in size and then keeps getting smaller. In case of a convex mirror, the image is always erect and smaller than the object, that is **diminished**. However, the size of the image decreases slightly as the object is moved away from the convex mirror.

This activity shows that spherical mirrors (concave and convex) behave differently from plane mirrors. A plane mirror always forms an erect image of the same size as the object. However, in the concave and convex mirrors, the size of the image changes as the distance of the object from the mirror changes. In addition, in the case of a concave mirror, the image also gets inverted when the object is taken away from the mirror. Lateral inversion of the image is seen in all three types of mirrors.

I just got an idea. We can also identify whether a mirror is plane, or concave, or convex by looking at the images of an object formed in them!

Yes. But where do we find concave and convex mirrors being used in our surroundings?



(a) (b)

Fig. 10.6: Use of concave mirror (a) As a reflector of a torch; (b) By a dentist

The reflectors of torches, headlights of cars and scooters are concave in shape (Fig. 10.6a). Have you ever noticed a dental mirror used by a dentist for inspecting teeth? It is a concave mirror which provides an enlarged view of teeth when held close to the teeth inside the mouth (Fig. 10.6b).

A step further

Do you remember learning about the use of telescope in the chapter 'Beyond Earth' in *Curiosity*, Grade 6? Most modern telescopes are reflecting telescope that use curved mirrors, with the main mirror being a large concave mirror.

Look at the side-view mirrors on vehicles. These mirrors are convex. They always form an erect image of the traffic behind and smaller than the actual vehicles. Also, since the convex mirror is

(a) (b) (c)

Fig. 10.7: Use of convex mirror as a (a) Side-view mirror; (b) Road safety mirror; (c) Surveillance mirror

curved outside, it provides a much wider area of the road behind. Further, such convex mirrors are installed at road intersections or sharp bends to provide drivers from both sides the visibility of the other side and prevent collisions. Convex mirrors are also installed in big stores to monitor a large area to deter thefts.

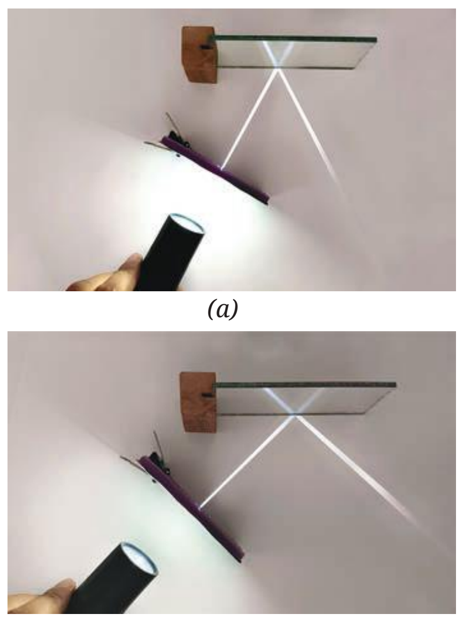
We have observed images formed by three types of mirrors—plane, concave, and convex. But are there any laws which govern the image formation?

10.3 What Are the Laws of Reflection?

Let us now repeat an activity which we did earlier in grade 7, but this time we will extend it further. Do you remember doing the activity for observing the reflection of a beam of light from a plane mirror?

Activity 10.4: Let us experiment

- Collect a plane mirror with stand, a torch, a comb, a paper clip to hold the comb upright, a sheet of white paper, and a strip of black paper.
- As you did earlier, make a thin slit by covering all openings of the comb using black paper, except for one in the middle.
- Spread a sheet of white paper on a table. Place the plane mirror upright on it.
- Using the thin slit and torch, obtain a thin beam of light along the paper and adjust it to fall upon the mirror as shown in Fig. 10.8a.
- Now, move the slit and torch slightly so that the beam of light falls at a different angle on the mirror (Fig. 10.8b). Does the reflected beam of light also shift?



(a)

(b)

Fig. 10.8: A beam of light falling on a mirror (a) At one angle; (b) At another angle

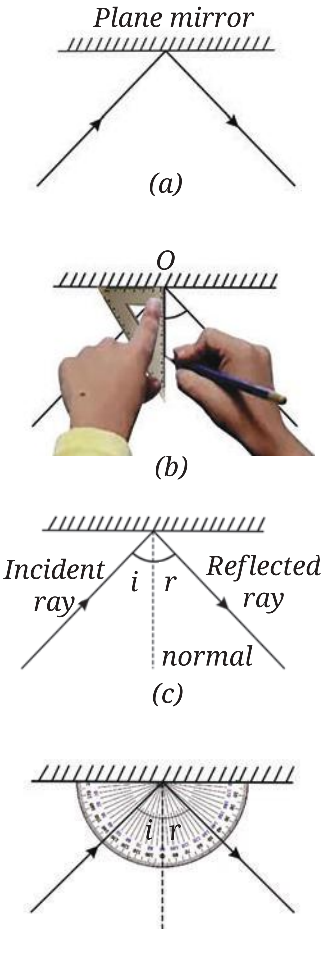


Fig. 10.9: (a) Drawing incident and reflected rays; (b) Drawing the normal; (c) Angle of incidence and angle of reflection; (d) Measuring angles

- Make the beam of light fall on the mirror at different angles and observe how the direction of the reflected beam changes.

To understand this better, let us **draw** this on a paper, step by step. But before doing that, let us learn how to represent light. We often represent light by straight lines with arrows, or **rays**. Rays indicate the path along which light travels. Do you remember learning earlier that the light travels along a straight line?

- Draw a line showing the position of the plane mirror. Also, draw lines with arrows (rays) indicating the beam of light falling on the mirror and the reflected beam of light as shown in Fig. 10.9a.

The ray of light that falls on the mirror is called the **incident ray**. The ray of light that comes back from the mirror is called the **reflected ray**.

- Now remove the mirror. From the point where the incident ray strikes the mirror, draw a line making an angle of 90° to the line representing the mirror. This line is known as the **normal** to the reflecting surface at the point of incidence, O (Fig. 10.9b).

The angle between the normal and the incident ray is called the **angle of incidence** (*i*) (Fig. 10.9c). The angle between the normal and the reflected ray is known as the **angle of reflection** (*r*) (Fig. 10.9c).

- On your drawing, **measure** the angle of incidence and the angle of reflection and note it in Table 10.1.
- Repeat the activity several times by changing the angle of incidence.
- Finally, let the incident beam fall on the mirror along the normal and observe the direction of the reflected beam. What would be the angle of incidence and angle of reflection in this case? Both the angles would be zero in this case.

Table 10.1: Measuring angles of incidence and reflection

S.No.	Angle of incidence (*i*)	Angle of reflection (*r*)

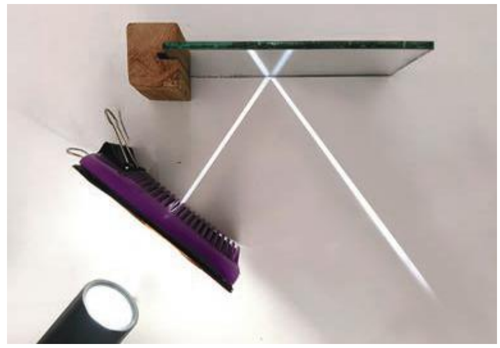
Do you notice that both angles in Table 10.1 are nearly equal? If done carefully, the experiment shows that **the angle of incidence (*i*) is equal to the angle of reflection (*r*)**. This is a law of reflection.

Activity 10.5: Let us experiment

- 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 (Fig. 10.10a).
- 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.

The reflected beam disappears when the sheet is bent but reappears when it is flattened again. This shows that the reflected beam lies in the same plane as that of the incident beam. Bending the sheet creates a new plane, breaking this alignment.

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



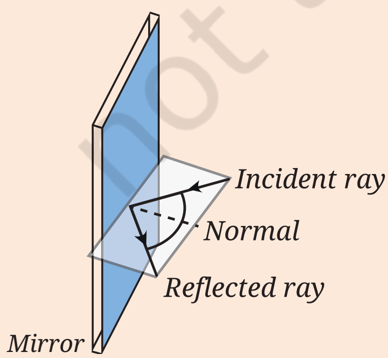
(a)

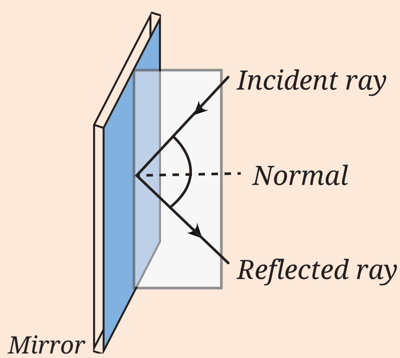
(b)

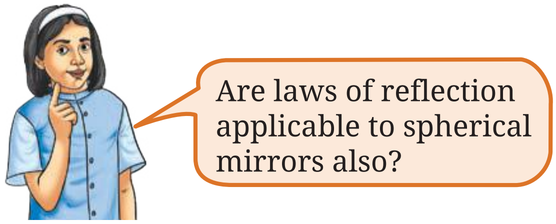
Fig. 10.10: (a) Reflected beam visible along the extended portion of paper; (b) Reflected beam not visible along the bent portion of paper

A step further

In the two cases, even though the directions of incident rays are different, they fall at the same point on the mirror, and thus, the directions of normal are the same. However, the direction of the reflected ray is such that the incident ray, the normal at the point of incidence, and the reflected ray all lie in the same plane in both cases.







The laws of reflection are valid for all kinds of mirrors—plane and spherical. But if multiple parallel rays fall on the spherical mirrors, we observe something interesting.

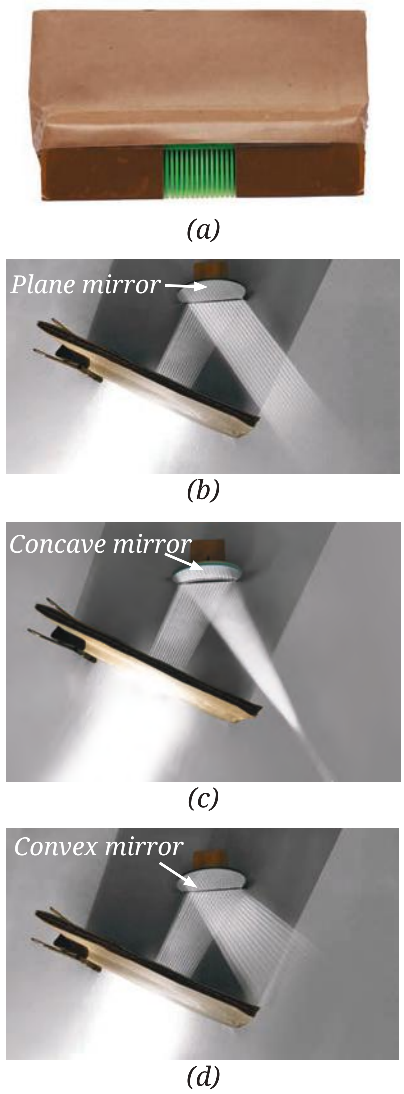


Fig. 10.11: (a) Multiple slits; Multiple parallel beams of light fall upon— (b) Plane mirror; (c) Concave mirror; (d) Convex mirror

Activity 10.6: Let us explore

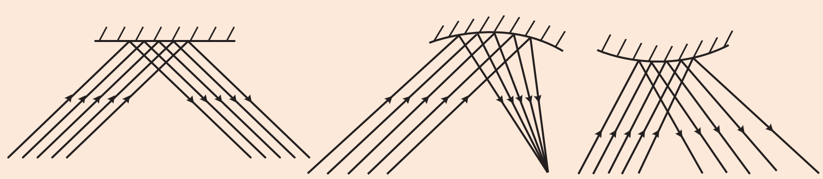
- Collect a plane mirror, a concave mirror, a convex mirror, stand for mirrors, a torch, a comb, and a paper clip to hold the comb upright.
- Use the same setup as Activity 10.4 again, but instead of a single slit, leave many openings of the comb uncovered to obtain multiple parallel beams of light (Fig. 10.11a).
- Let the multiple parallel beams of light fall upon the plane mirror, concave mirror, and 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)?

When multiple parallel beams of light fall upon a plane mirror, the multiple reflected beams are also parallel (Fig. 10.11b). However, when multiple beams of light fall upon a concave mirror, the multiple reflected beams get closer, that is, they **converge** (Fig. 10.11c). Whereas, in the case of a convex mirror, the multiple reflected beams spread, that is, they **diverge** (Fig. 10.11d).

In the case of spherical mirrors, even though each ray of light follows the laws of reflection, the curved surface of spherical mirrors causes the parallel beam of rays to either converge (concave) or diverge (convex) on reflection depending on the shape of the mirror.

A step further

If we draw what we observed in Activity 10.6, we get the figures like those shown below.



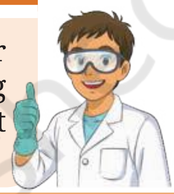
So, the concave mirror converges a light beam while the convex mirror diverges it. This is indeed interesting!

Since the concave mirror converges the light beam, wouldn't light get concentrated in a small area?

Activity 10.7: Let us explore

Safety first

Always perform this activity under the supervision of a teacher or an adult. Do not look towards the Sun or into the mirror reflecting the Sun. Focus the reflected light only on a piece of paper, not towards anyone's face or eyes.



- Take a concave mirror and a sheet of thin paper or newspaper.
- Hold the concave mirror with its reflecting surface facing the Sun. Direct the light of the Sun reflected by the mirror on the sheet of paper.
- Adjust the distance of the paper until you get a sharp bright spot on it as shown in Fig. 10.12.
- Hold the mirror and the sheet of paper steady for a few minutes. Does the paper start to burn producing smoke?

Fig. 10.12: Converging sunlight on paper using a concave mirror

The bright spot is formed on the paper because light from the Sun, after reflection from the mirror, gets concentrated on this point. This produces sufficient heat at this point which can ignite the paper.

A step further

Devices which concentrate sunlight into a small area, using mirrors and lenses, are called solar concentrators. The concentrated sunlight is used to heat a liquid to produce steam which can be used to generate electricity or for providing heat for various purposes, such as large scale cooking or for solar furnaces. Solar furnaces are even used for melting steel! Do you remember learning in an earlier chapter, about electric furnaces for melting steel?

10.4 What Is a Lens?

Imagine looking through a flat transparent glass window pane—all objects look the same size and shape. But would those objects continue to look the same if the surface of the transparent material is curved?

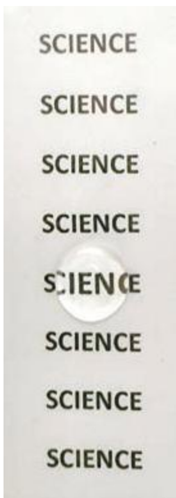


Fig. 10.13: View of text beneath the water drop

Activity 10.8: Let us explore

- Collect a flat strip of glass or clear plastic, such as a flat scale, few drops of oil, dropper, water, and a paper or book with some text printed on it.
- Spread a few drops of oil on the surface of glass or plastic strip and rub it to leave a very thin coating. You can also use wax instead of oil.
- Using a dropper or your finger, place a small drop of water on the oiled/waxed spot. (The oil/wax helps the water form a nice round drop.)
- **Examine** the water drop. What is the shape of its surface? Is it flat or curved inward or curved outward?
- Place the paper underneath the glass/plastic strip such that the text is directly under the water drop (see Fig. 10.13).
- Now, look down through the water drop at the text below. Do you find some change in the size of the letters just below the water drop? Do they look enlarged or smaller?

The surface of the water drop is curved outside. The letters under the water drop look different— they might appear larger than the letters nearby! The curved surface of the water drop made the size of the text look different. This curved drop of water is acting like a simple lens. Have you seen a magnifying glass as shown in Fig. 10.14? It is also a lens that helps in reading small print by making the letters appear bigger.

Fig. 10.14: A magnifying glass

A **lens** is a piece of transparent material, usually made of glass or plastic, which has curved surfaces. Like mirrors, lenses can also be convex or concave.

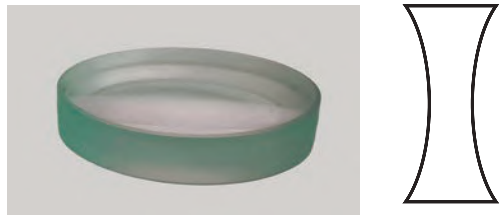
A lens which is thicker at the middle as compared to the edges is called a **convex lens** (Fig. 10.15a).

(a) (b)

Fig. 10.15: (a) A convex lens; (b) Its representation

A lens which is thicker at the edges as compared to the middle is called a **concave lens** (Fig. 10.16b).

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



(a) *(b)*

Fig. 10.16: (a) A concave lens; (b) Its representation

What changes can be seen in the objects when viewed through lenses?

Activity 10.9: Let us experiment

- Collect a convex lens, a concave lens, a lens holder, and a small object.
- Take the convex lens and place it upright using its holder.
- Place the object behind the convex lens (it may also be placed on something to bring it up to the level of the lens).
- Look at the object through the lens from the other side of the lens (Fig. 10.17a) and note your observations in your notebook.
- Now slowly move the object farther from the lens and keep observing how the image changes. 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 recorded in your notebook and **compare** the images seen through both lenses. What conclusions do you draw?

When an object is placed behind a convex lens at a small distance from it and seen through the lens, the object appears erect and enlarged in size. As the distance between the object and the convex lens increases, the object appears inverted. It is initially enlarged in size and then diminishes in size. An object placed behind a concave lens and seen through the lens, always appears erect and diminished in size. Its size changes, as its distance from the lens increases.

(a) *(b)* *(c)*

Fig. 10.17: An object as seen through a (a) Convex lens placed at small distance; (b) Convex lens placed at large distance; (c) Concave lens

Do lenses also converge or diverge the light beam?

Activity 10.10: Let us investigate

- Collect a thin transparent glass plate, a convex lens, a concave lens, a torch and a comb to obtain multiple parallel beams of light, a paper clip to hold the comb upright, two identical books, and sheets of white paper.
- Using two books placed adjacent to each other, fix the glass plate or lens upright in between them as shown in Fig. 10.18. Spread paper sheets on both books.
- Now let the multiple parallel beams of light fall upon the thin glass plate, convex lens, and concave lens one by one as shown in Fig. 10.18. Does the parallel beam of light pass through as it is in all three cases?
- **Record** and analyse your observations.

The light beam passes through the thin glass plate as it is. The convex lens converges the light falling on it while the concave lens diverges the light. A convex lens is also called a **converging lens** while a concave lens is called a **diverging lens**.

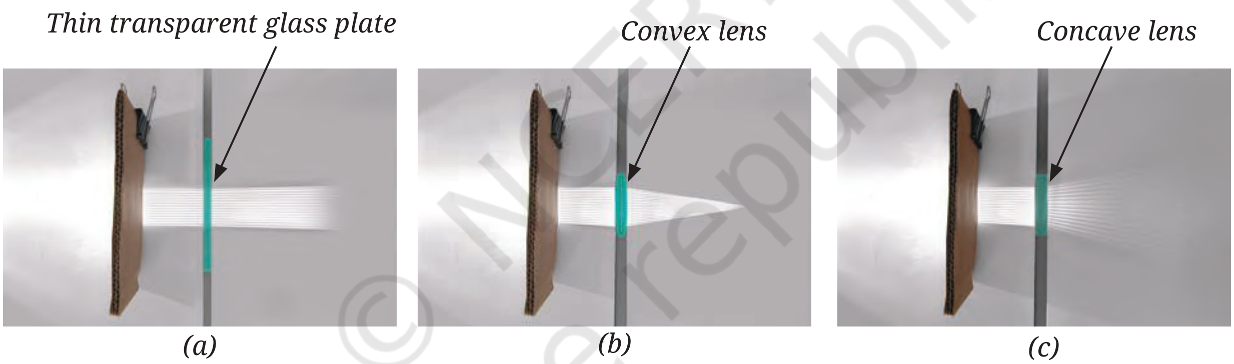
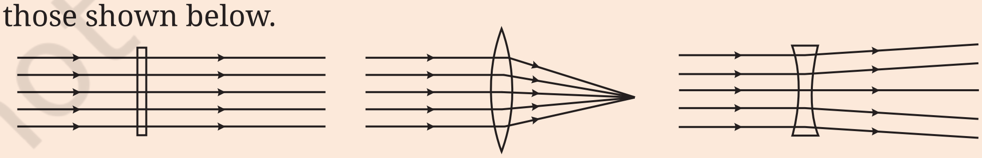


Fig. 10.18: Multiple parallel beams of light fall upon the (a) Thin glass plate; (b) Convex lens; (c) Concave lens

A step further

If we draw what we observed in Activity 10.10, we get the figures like those shown below.



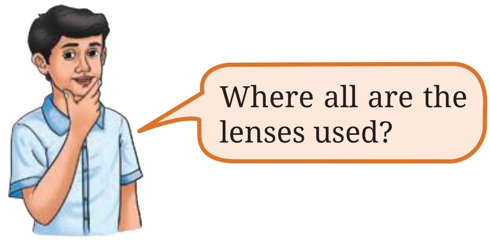
Since convex lens converges a light beam, can it also burn a paper?

Activity 10.11: Let us investigate

- 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?

Safety first

Do not look at the Sun directly or through the lens as it may damage your eyes.



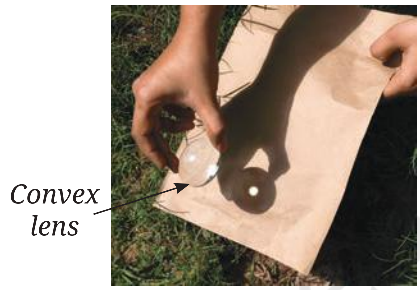


Fig. 10.19: Converging sunlight on paper using a convex lens

Lenses are important and are used everywhere around us. The eyeglasses that people wear to help them see clearly are lenses! Cameras, telescopes, and microscopes all use lenses to work. Even our eye has a convex lens inside it. It is quite an amazing lens that can change its shape, which is what allows us to read a book or see something far away.

(a) (b)

Fig. 10.20: (a) Eyeglasses; (b) Smartphone camera lenses

Snapshots

- Image formed by a concave mirror can be enlarged, diminished or of the same size as the object, and it may be erect or inverted, depending upon the distance of the object from the mirror.
- Image formed by a convex mirror is always erect and diminished in size.
- Two laws of reflection are:
  - The angle of incidence is equal to the angle of reflection.
  - The incident ray, the normal to the mirror at the point of incidence, and the reflected ray, all lie in the same plane.
- The laws of reflection are valid for all kinds of mirrors — plane, concave, and convex.
- A concave mirror converges the light beams while a convex mirror diverges it.
- Image formed by a convex lens can be enlarged, diminished or of the same size as the object, and it may be erect or inverted, depending upon the distance of the object from the mirror.
- Image formed by a concave lens is always erect and diminished in size.
- A convex lens converges the light beams while a concave lens diverges it.

Keep the curiosity alive

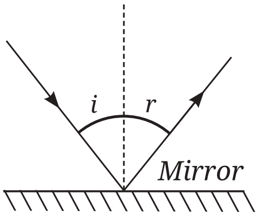


Fig. 10.21

1. 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°

2. 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.

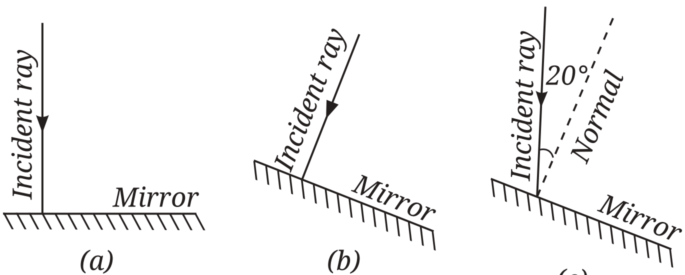


Fig. 10.22

   Draw the reflected ray in each case (Use a ruler and protractor for accurate drawing). What is the angle of reflection in each case?

3. In Fig. 10.23, the cap of a sketch pen is placed in front of three types of mirrors.

(i) *(ii)* *(iii)*

Fig. 10.23

   Match each image with the correct mirror.

Image	Mirror
(i)	Plane mirror
(ii)	Convex mirror
(iii)	Concave mirror

4. 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) *(ii)* *(iii)*
Fig. 10.24

Image	Lens/glass type
(i)	Flat transparent glass piece
(ii)	Convex lens
(iii)	Concave lens

5. 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

6. 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.

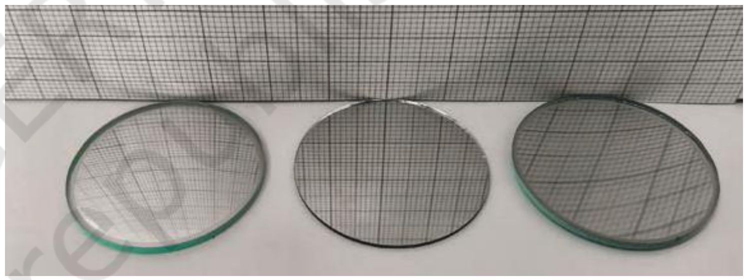


Fig. 10.25

7. In a museum, a woman walks towards a large convex 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.

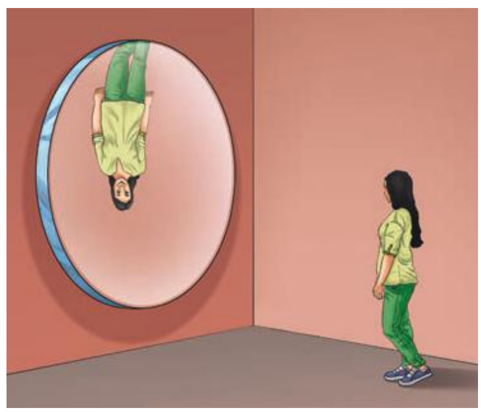


Fig. 10.26

8. 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?

9. Match the entries in Column I with those in Column II.

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

10. 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.

Choose the correct option:

(i) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion.

(ii) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion.

(iii) Assertion is correct but Reason is incorrect.

(iv) Both Assertion and Reason are incorrect.

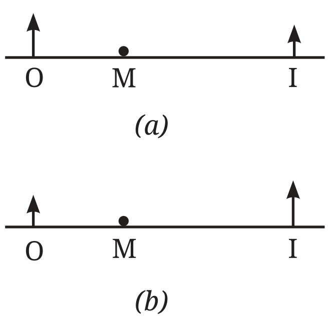


Fig. 10.27

11. 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.

Prepare some questions based on your learnings so far ...

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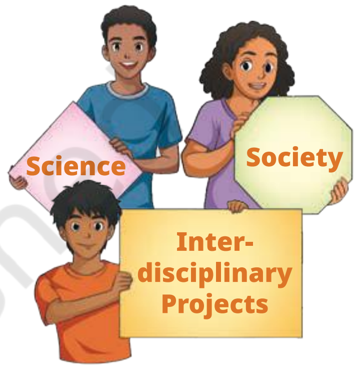
12. Place a pencil behind a transparent glass tumbler (Fig. 10.28a). Now fill the tumbler halfway with water (Fig. 10.28b). How does the pencil appear when viewed through the water? **Explain** why its shape appears changed.

(a) (b)

Fig. 10.28

Discover, design, and debate



- 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.

Fig. 10.29

- 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.
- 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.

Our scientific heritage

More than 800 years ago, during the time of the great Indian mathematician Bhāskara II, astronomers used shallow bowls of water to observe the stars and planets. By carefully looking at their reflected images through tubes placed at appropriate angles, they could measure the positions of stars and planets in the sky. Even though the laws of reflection are not mentioned in literature, their instruments and methods indicate that they might have understood it in practice!

Reflect on the questions framed by your friends and try to answer ...

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