

Using Mirrors to Form Images

Before You Read

You stand in front of a mirror. In what ways is your reflection the same as you? In what ways is your reflection different from you? Write your ideas on the lines below.



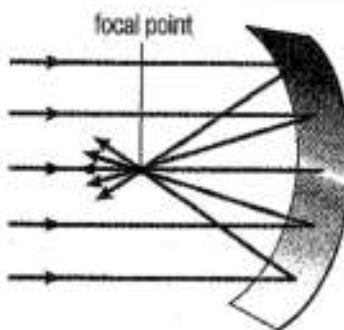
Mark the Text

Identify Concepts

Highlight each question heading in this section. Then use a different colour to highlight the answers to the questions.

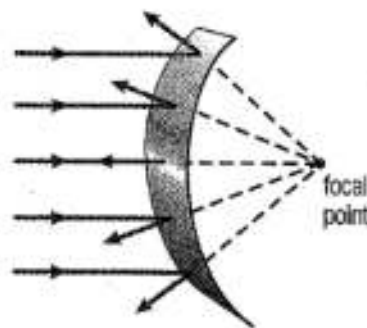
reflected light rays converge at the focal point

incoming light rays are parallel to one another



reflected light rays diverge so they do not meet

incoming light rays are parallel to one another



What are three common types of mirrors?

There are three common types of mirrors:

1. A plane mirror is a mirror with a flat surface. You might find a plane mirror on a bathroom wall or cabinet.
2. A **concave** mirror is a mirror that curves inward, like the inside of a spoon. A flashlight has a concave mirror behind the bulb. Shaving mirrors and make-up mirrors are concave, too.
3. A **convex** mirror is a mirror that curves outward, like the outside of a spoon. Some bicycle mirrors are convex. The large, curved mirrors that are used for security in many stores are convex, too. ●



Reading Check

1. How is a concave mirror different from a convex mirror?

What happens when light rays strike curved mirrors?






You learned what happens to light rays when they reflect from a plane mirror in section 5.1. Light rays behave in a different way when they reflect from curved mirrors.

The light rays that reflect from a concave mirror meet (converge) at a single point. This point is called a **focal point** because the light rays focus together there. Light rays that meet at a focal point are called **converging** light rays.

The light rays that reflect from a convex mirror spread out (diverge). Light rays that spread out after they reflect from a convex mirror are called **diverging** light rays. ●

How do the images formed in mirrors compare?

All mirrors form images of objects because mirrors reflect the light that strikes them in a regular pattern. How the image looks depends on whether the mirror is flat or curved.

Appearance of image	Plane mirror	Concave mirror (if object is near the mirror)	Concave mirror (if object is far from the mirror)	Convex mirror
Object 	Object as seen in plane mirror 	Object as seen in concave mirror (near mirror) 	Object as seen in concave mirror (farther from mirror) 	Object as seen in convex mirror 
Location	behind the mirror	behind the mirror	In front of the mirror	behind the mirror
Size	same size as object	larger than object	smaller than object	smaller than object
Shape	same shape	different shape	different shape	different shape
Left-right orientation	reversed	reversed	reversed	reversed
Up-and-down orientation	upright	upright	upside down	upright

✓ Reading Check

2. What is the difference between light rays that are converging and light rays that are diverging?

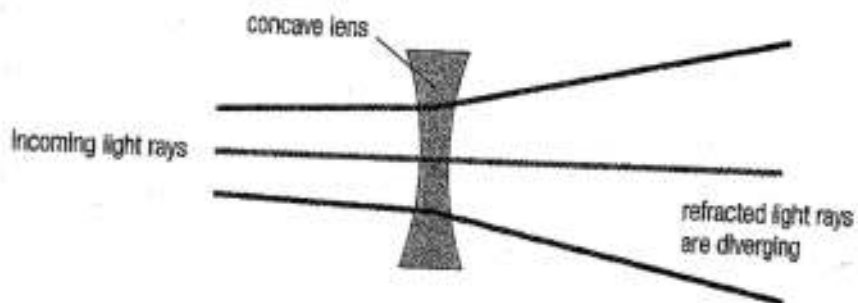
Using Lenses to Form Images

Before You Read

Many common devices, such as eyeglasses and magnifying glasses, have lenses. What are lenses used for? Record your ideas in the lines below.

State the Main Ideas

As you read this section, stop after each paragraph. Put what you have just read into your own words.



What is a lens?

A **lens** is a piece of transparent material that is curved so that light rays will refract as they pass through it. The more curved the sides of a lens are, the more a ray of light will refract as it passes through the lens. There are two types of lenses: concave and convex.

What is a concave lens?

A concave lens

- ◆ is thinner in the middle and thicker at the edges
- ◆ refracts light rays that pass through it away from the normal. The light rays diverge and do not meet at a focal point.
- ◆ forms images that are upright
- ◆ forms images that are smaller than the object ✓

✓ Reading Check

1. What happens to light rays that pass through a concave lens?

What is a convex lens?

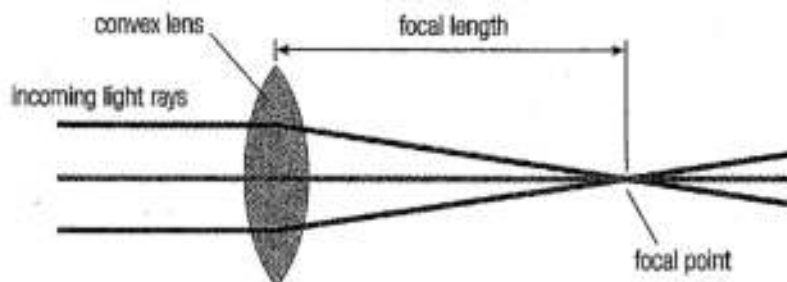
A convex lens

- ◆ is thicker in the middle and thinner at the edges.
- ◆ refracts light rays that pass through it toward the normal.
The light rays converge at a focal point.

The image formed by a convex lens depends on how far the object is from the focal point. The distance from the centre of the lens to the focal point is called the **focal length**.

- ◆ If an object is between the lens and the focal point (less than one focal length), the image is upright and larger than the object.
- ◆ If an object is more than one focal length away from the lens, the image is upside down and smaller than the object.

Distance of an object from the convex lens	How the image compares with the object
more than two focal lengths	upside down and smaller
between one and two focal lengths	upside down and larger
directly at the focal point	no image forms
less than one focal length	upright and larger



✓ Reading Check

2. What is the focal length of a lens?
