11
Chapter

Light

We'll cover the following key points:

- Light & Colours of Light
- Mirrors
- Lens

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 5th we learnt

- Light and its sources
- Light Travels in a Straight Line

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the nature and properties of light.
- They will be able to explain how light travels and how it interacts with different materials.
- Students will learn about the reflection and refraction of light and the role of mirrors and lenses in manipulating light.
- They will explore the formation of images by mirrors and lenses and how these concepts apply in daily life.
- Students will gain insights into the spectrum of light and how different colours are formed.

Guidelines for Teachers

To introduce the chapter, the teacher can begin by discussing how we perceive light and how it allows us to see objects. This can lead into a conversation about the various ways light interacts with different materials. The teacher can use a prism to demonstrate how white light is composed of various colours. A demonstration with mirrors and lenses can help students understand how light can be reflected and refracted. Using everyday examples like mirrors and magnifying glasses can make these concepts more relatable.

NCF Curricular Goals and Competencies

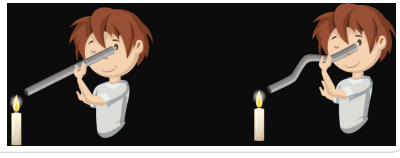
This chapter addresses the following curricular goals and competencies:

CG-7 (C-7.1): Students communicate their own questions, observations, and conclusions related to science.

Mind Map

LIGHT

Light travels along a straight line



Right or left

- In the mirror the right appears left and the left appears right.
- Only sides are interchange; the image does not appear upside down.

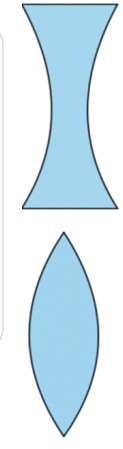
Images formed by lenses

i.Concave lens

Diverges the light outward. Image formed is virtual erect and smaller in size.

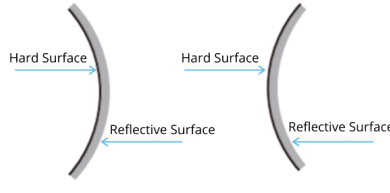
ii. Convex lens

Converges the light falling on it, image formed is inverted and real



Reflection of light

The process through which light rays falling on surface on an object are sent back.



Playing with spherical mirrors

Concave mirror : Image formed can be smaller or longer in size. It is also called converging mirror.

Uses : BY ENT doctor, By dentist, reflectors of torch, headlight

Convex Mirror : Image formed is smaller in size. It is also called diverging mirror.

Uses : Rear - View mirror

NOTE

Real image : Image formed on a screen is called real image.

Virtual image : Image not formed on screen is called virtual image

Sunlight

Sunlight consists of seven colors i.e. red, orange, yellow, green, blue, indigo and violet. Sunlight is said to be white light.

Based on NCERT*

Light & Colours of Light

The teacher is holding a prism and shining a beam of white light through it.

Introduction

Light is a form of energy that allows us to see the world around us. It travels in a straight line and can bounce off surfaces (reflection) or bend when passing through different materials (refraction). The Sun is the primary natural source of light, while artificial sources include bulbs and candles.

In History...

- **Isaac Newton:** Discovered that white light is made up of various colours.
- **Alhazen (Ibn al-Haytham):** Made significant contributions to optics, including the study of reflection and refraction.
- **Rene Descartes:** Developed the law of refraction (Snell's Law).
- **James Clerk Maxwell:** Formulated the theory of electromagnetic waves, explaining the nature of light.
- **Thomas Young:** Conducted the double-slit experiment, demonstrating the wave nature of light.

KEYWORDS

Illuminates: The study of light and its behavior reveals the mysteries of the visible world and beyond.

Optics: This branch of physics unravels the science of light, guiding innovation in lenses, vision, and technology.

Light

Light is a form of energy. When a beam of light enters a dark room through a crack or a tiny hole, it illuminates things that lie in its path. The beam of light appears to travel in a straight line. The same is true about the beam of light from a torch, a lighthouse, and the headlamps of vehicles. So, can we say that light travels in a straight line?

Rectilinear Propagation of Light

Rectilinear Propagation of Light refers to the phenomenon where light travels in straight lines. This principle can be observed when light passes through a narrow opening or when shadows are formed.

Straight-Line Path: Light moves in a straight direction until it interacts with an object or medium.

Examples: Shadows formed by opaque objects demonstrate this principle.

Application: It explains how pinhole cameras work and how light creates well-defined shadows.

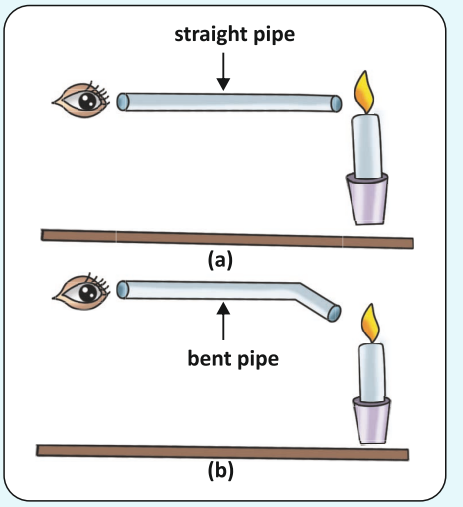
Experiment: A beam of light passing through a slit or tube shows a clear straight-line path.

Limitation: The straight-line path changes when light interacts with reflective or refractive surfaces.

Activity

Aim: To demonstrate that light travels in a straight line **(Note: Activity to be performed under adult's supervision)**

Materials required: A sheet of paper, a candle, and a matchstick.



Method:

- Make a pipe using the sheet of paper, and light the candle.
- Point one end of the paper pipe towards the candle.
- Bring your eye closer to the other end of the pipe and try to look at the flame through it. Record your observation.
- Bend the pipe as shown in (b) and try to look again at the flame through the pipe. Record the observation again.

Observation: You will be able to see the flame through the straight pipe but not through the bent pipe.

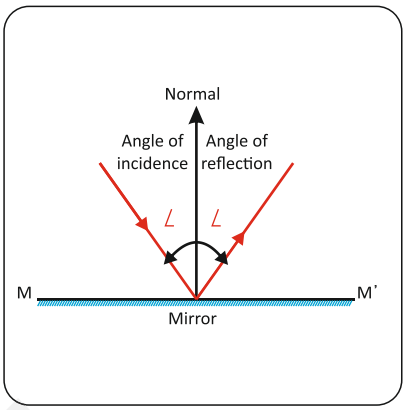
Explanation:

- When the pipe is straight, it provides a straight line path for the light beam to trave from the candle to the eye. This makes the flame visible.
- When the pipe is bent, there is no straight line path for the light to travel from the candle to the eye. Therefore, the flame is not visible.

Conclusion : The above observation clearly shows that light travels in a straight line in a uniform transparent medium like air. This property of light is called rectilinear (straight line) propagation (movement).

Reflection of Light

If we throw a tennis ball at a wall, the ball bounces back. This means that when the tennis ball strikes the wall, the wall sends it back. Similarly, when light falls on the surface of an object, the object sends the light back. The process of sending back the light rays which fall on the surface of an object is called reflection of light.



Angle of incidence: The angle formed between the incident ray and the normal is called the angle of incidence.

Angle of reflection: The angle formed between the reflected ray and the normal is called the angle of reflection.

COLOURS OF LIGHT

Take a transparent ruler and hold it in sunlight. Adjust its position a little till you see a hue of various colours. Notice that the white sunlight splits into seven different colours. You can also see these seven colours in the sky in a rainbow formed after it has rained and the air is still lade- with moisture. The sunlight on passing through the droplets of rain forms a band of colours which we call a rainbow.

Seven colours of white light

This phenomenon of splitting of white light is called dispersion, and the band of colours is called a spectrum. The seven colours in the spectrum of white light are violet, indigo, blue, green, yellow, orange, and red, known as VIBGYOR.

Newton's colour disc

Newton's colour disc is a disc of cardboard or metal which is divided into seven sectors which are painted in the colours of VIBGYOR. When the disc is rotated very fast. it appears almost white. This is because the image of each colour on the retina does not get erased before the image of the other colour forms on it due to the fast movement of the disc. This phenomenon is called **persistence of vision**. The reason why the colour on the disc does not appear exactly white is because the colours on the disc are not exactly like the colours in the natural spectrum of light.

(a) colours of white light

(b) rotating disc

Newton's disc

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Apply Concept in Context

Apply

- How does rectilinear propagation of light explain the formation of shadows?
- If a mirror is used to reflect light in a room, how does the angle of incidence affect the direction of the reflected light?

Skills Covered: Critical thinking, Analytical thinking, Observation

Examine Further

Analyse

- What will happen if multiple mirrors are placed at different angles around a light source?
- Analyze how the colors on a Newton's Disc merge to appear white when spun rapidly.

Skills Covered: Analytical thinking, Brainstorming, Research

Self-Assessment Questions

Evaluate

- What is rectilinear propagation of light, and how is it demonstrated in experiments?
- What is the law of reflection?
- What is a Newton's Disc, and what principle does it demonstrate?
- How can you explain the concept of dispersion by raindrop?

Skills Covered: Observation, Research, Recall

Creative Insight

Create

Light plays a crucial role in everyday life and scientific applications. Rectilinear propagation explains shadows and pinhole cameras. Reflection of light has applications in optics and imaging, while Newton's Disc demonstrates color mixing principles. Dispersion helps us understand phenomena like rainbows and spectrum formation.

Task: Create a comparison table or chart showing the principles, phenomena, and real-life applications of rectilinear propagation, reflection of light, Newton's Disc, and dispersion.

Skills Covered: Creativity, Research, Brainstorming

Bloom's Taxonomy

Mirrors

The teacher is holding a plane mirror.

Image

It is the impression of an object formed due to reflection of light in a mirror is called image. It is of two types as explained below:

Real image: The image that can be formed on a screen is called real image. It is formed due to intersection of incident and reflected rays. It is always inverted, e.g., the image formed on the screen in a cinema hall.

Virtual image : The image that cannot be formed on a screen is called virtual image. It appears to meet at a point. It is always erect, e.g., the image formed by a plane mirror.

Image Formed by a Plane Mirror

Plane mirror is a flat glass surface which is polished silver on its back face.

Activity

- Stand in from of a plane mirror and raise your left hand. See it in the mirror. It appears to be your right hand. You will observe that in the mirror, the right hand appears left and the left hand appears right. The property of light in which left appears right and right appears left is known as lateral inversion.
- Place a lighted candle in front of a plane mirror. Now, move the candle to different positions in front of the plane mirror. Observe the image in each case. We will observe that if we move the candle towards the mirror, image also moves towards the mirror and it is also of the same size as the object. It means that the image formed in plane mirror is of same size and the image formed is always at the same distance as the object is placed in front of it.

Characteristics of Image Formed by

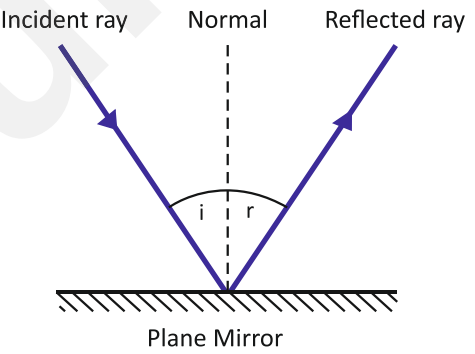
Plane Mirror

- When we look into the mirror, the image of any object appears to be behind the mirror. In general we can say that: The image formed in a plane mirror is behind the mirror.
- The image formed in a plane mirror is virtual. The image formed in a plane mirror can be received on a screen.
- The image in a plane mirror is of the same size as the object. It is neither smaller nor bigger than the object.
- The image formed in a plane mirror is erect (or upright). It is the same side up as the object.
- The image formed in a plane mirror is at the same distance behind the mirror as the object in front of the mirror. The distance of an image from the mirror is equal to the distance of an object from the mirror.
- The image formed in a plane mirror is laterally inverted.

Uses of Plane Mirror

Some important uses of plane mirror are as follows:

- They are used as reflectors in solar cookers.
- They are used for making kaleidoscope and periscope.
- Plane mirrors are used as looking glasses.
- They are used to record observation in some scientific instruments like barometer.



SPHERICAL MIRRORS

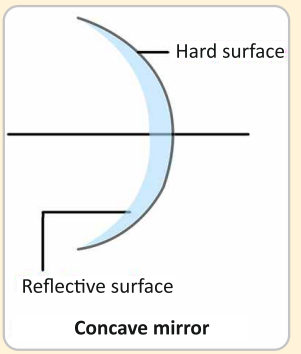
If the reflecting mirror is a part of a sphere, then it is called spherical mirror.

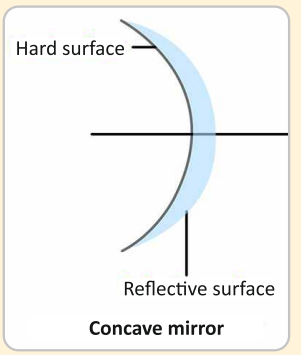
Types of Spherical Mirrors

Spherical mirrors are of two types-Concave mirror and convex mirror.

Concave mirror : A concave mirror is called a converging mirror. If a set of parallel rays fall on a concave mirror, they reflect and meet at one point. Hence, it is called a converging mirror and the point at which the rays meet is called the focus of the mirror. The distance from the focus to the mirror is called its focal length. Let us learn about the image formed by a concave mirror.

Convex mirror : If the inner surface of the slice from a hollow sphere of glass is polished silver and the outer surface behaves as the reflecting surface, it is called a convex mirror. A convex mirror is also called diverging mirror.





Parameters of Spherical Mirrors

Pole: The geometric centre of the spherical mirror is called its pole. It is denoted by capital 'P'.

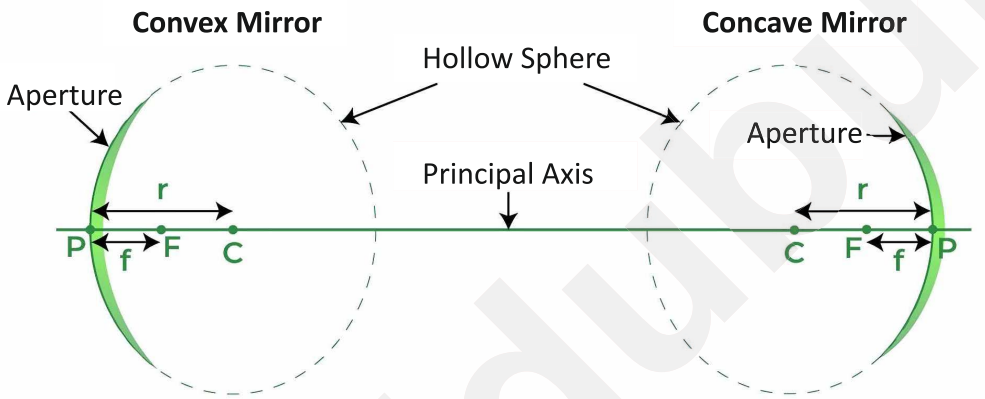
Centre of curvature: The centre of the hollow sphere, from which the mirror has ben taken out, is called its centre of curvature. It is denoted by capital 'C'.

Principal axis : A straight line passing through the pole and the centre of curvature of a spherical mirror is called its principal axis.

Radius of curvature : The distance between the pole (P) and the centre of curvature (C) is called the radius of curvature of the spherical mirror. It is denoted by 'R'.

Focus : The mid-point of the pole and centre of curvature of the spherical mirror is called its focus. It lies on the principal axis and is denoted by capital 'F'.

Focal length : The distance between the pole (P) and the focus (F) of the spherical mirror is called the focal length of the spherical mirror. It is denoted by small 'f'.



Here,

F = Focal Point

C = Center of Curvature

f = Focal Length

r = Radius of Curvature

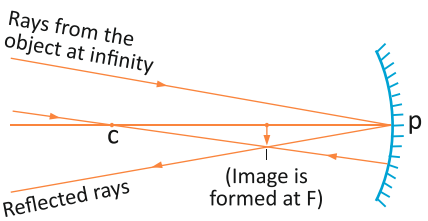
P = Pole

Images Formed by Concave Mirror

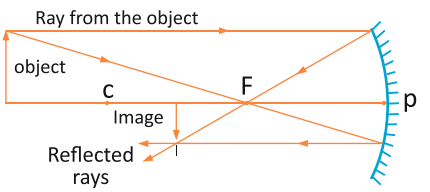
The characteristics of image formed by concave mirror are given below:

- Image can be real or virtual depending on the position of the object.
- The size of the image can be smaller or enlarged.
- Real image is formed in front of the mirror while virtual image is formed behind the mirror.

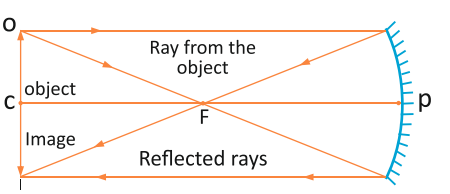
The nature and ray diagrams of images formed by concave mirror of an object placed at different places are as follows:



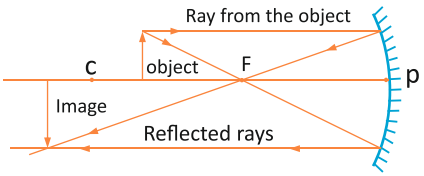
(a) When the object is at infinity



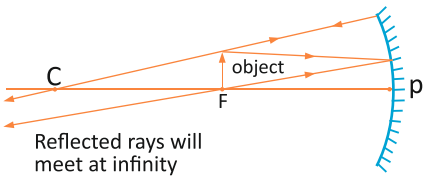
(b) When the object is beyond C



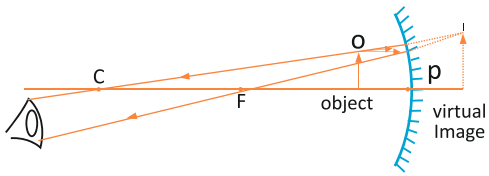
(c) When the object is at C



(d) When the object is between C and F



(e) When the object is at F



(f) When an object the between F and P

Images formed by concave mirror for different positions of the object.

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At focus F	Highly diminished, point-sized	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

Uses of Concave Mirrors

Concave mirrors are used for many purposes. Some of the important uses are:

- Concave mirrors are used as reflectors in torches, headlights of vehicles (such as cars, scooters, buses, trucks, trains engines, etc.) to get a strong straight beam of light.
- Concave mirrors are used as shaving mirrors by man to see an enlarged face. Women also use concave mirrors as 'make-up' mirrors to see an enlarged image of the face.
- Doctors use concave mirrors to produce a parallel beam of light for examining body parts such as eyes, ears, nose and throat.
- Concave mirrors are used by dentist to see an enlarged image of teeth.

Image Formed by Convex Mirror

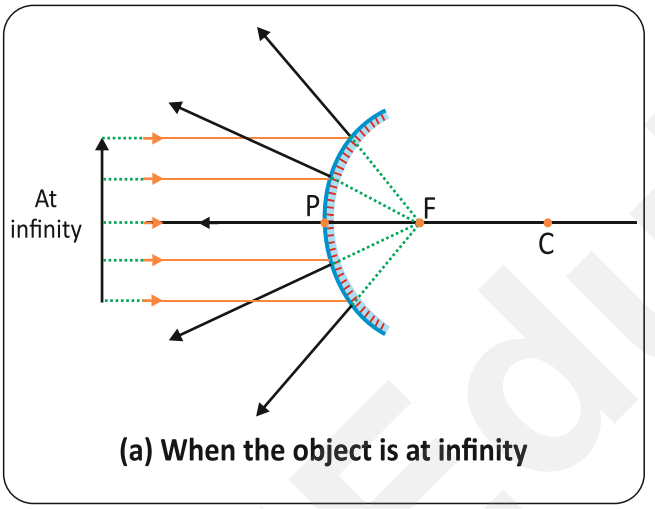
The characteristics of image formed by convex mirror are as follows:

- The nature of the image is virtual and erect.
- The size of the image is smaller than the size of the object.
- The position of the image is behind the mirror.

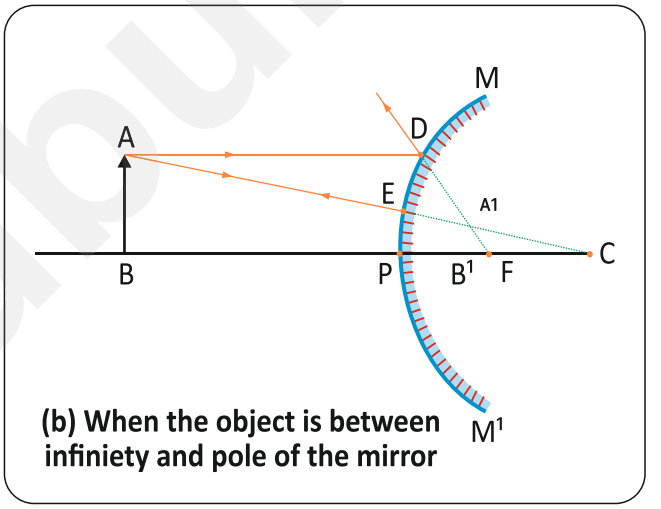
The nature and ray diagrams of images formed by convex mirror of an object placed at different places are given ahead :

Images formed by convex mirror for different positions of the object

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	Behind the mirror at focus	Highly diminished (point-sized)	Virtual and erect
Between P and infinity	Behind the mirror between P and F	Diminished	Virtual and erect



(a) When the object is at infinity



(b) When the object is between infiniety and pole of the mirror

Images formed by convex mirror for different positions of the object

Uses of Convex Mirrors

Some important uses of convex mirrors are as follows:

- Convex mirrors are used a rear-view mirrors on the sides of the driver's seat in the vehicles.
- Convex mirrors are used as distance view mirrors at the turning points of narrow staircases.
- Convex mirrors are used for vigilance at big shops and warehouses.

Convex mirror is used in cars

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Apply Concept in Context

Apply

- How do mirrors create images, and what are the differences between real and virtual images?
- How would the image change if you used a curved mirror instead of a plane mirror?

Skills Covered: Critical thinking, Applicative thinking, Problem-solving

Examine Further

Analyse

What happens to the size and orientation of the image if the mirror is curved? How does this relate to the way curved mirrors are used in real-life applications like telescopes?

Skills Covered: Analytical thinking, Problem-solving, Research

Self-Assessment Questions

Evaluate

- What is the difference between the images formed by concave and convex mirrors?
- How does the law of reflection work, and what role does it play in the functioning of mirrors?
- How do mirrors help in everyday life, such as in vehicles or optical instruments?

Skills Covered: Research, Observation, Recall

Creative Insight

Create

Mirrors manipulate light to form images, and different types of mirrors can alter the size, shape, and orientation of the image.

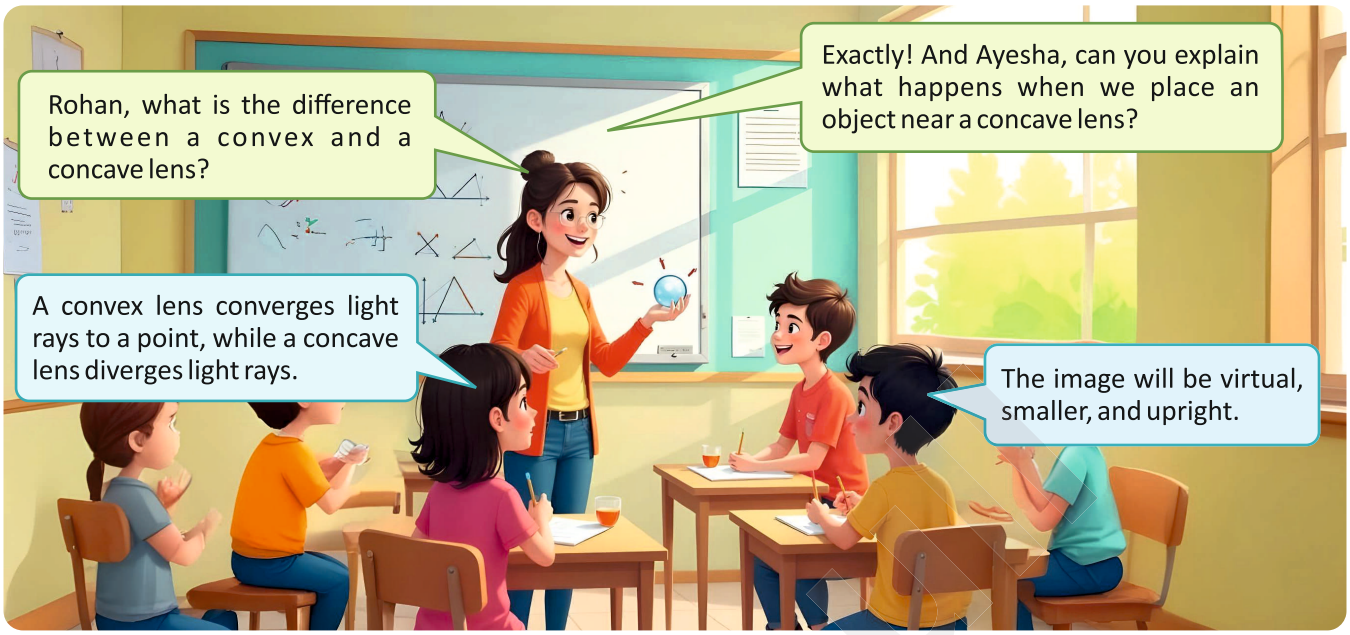
Task: Draw and label the different types of mirrors (plane, concave, convex) and show how each forms an image.

Skills Covered: Creativity, Research, Observation, Brainstorming

Bloom's Taxonomy

Lens

The teacher is holding a convex and a concave lens.



Do you know you are able to read these lines? It is with the help of a transparent lens in your eyes which helps to form images on your retina.

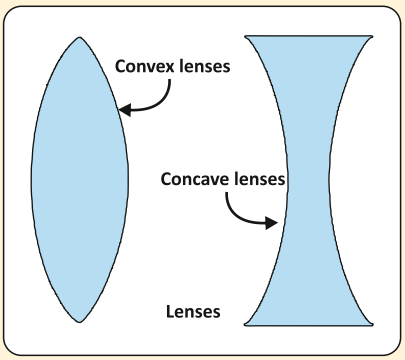
You may have seen lenses often without realising it. The spectacles, contact lenses and magnifying glass etc. contain lenses.

Let us learn what are lenses and how they work. A lens is a transparent, curved surface, made up of high quality glass or transparent plastic.

Types of Lenses

Lenses are of two types-Convex lens and concave lens.

- **Convex lens:** It is thicker in the middle than at the edges. A convex lens is also called a converging lens, as it converges the rays of light falling on it.
- **Concave lens:** It is thicker at the edges than in the middle. A concave lens is also called a diverging lens, as it diverges the rays of light falling on it. Based on their converging and diverging abilities, lenses are extensively used in spectacles.



Why do lemons and decorative marbles kept in a circular container of water appear to be larger?

Lemons and decorative marbles kept in a transparent circular container of water appear bigger than the actual size, because of magnifying action of water behaving as a convex lens.

Did You Know ?

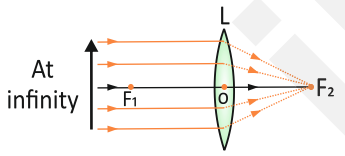
The lens present in the human eye are convex lens, made up of a transparent jelly like material.

Images Formed by Convex Lens

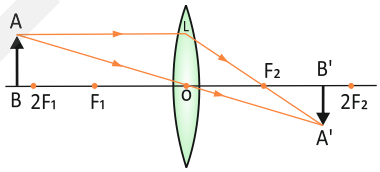
Convex lens forms different types of images depending on the position of the object.

Image formation by convex lens for different positions of the object

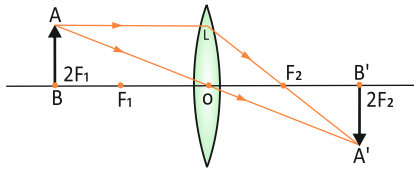
S. No.	Position of the object	Position of the image	Relative size of Position of the image	Nature of the image
1.	At infinity	At focus F_2	Highly diminished (point-sized)	Real and inverted
2.	Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
3.	At $2F_1$	At $2F_2$	Same size	Real and inverted
4.	Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
5.	At focus F_1	At infinity	Infinitely large (highly enlarged)	Real and inverted
6.	Between focusF_1 and optical centre O	on the same side of the lens as the object	Enlarged	Virtual and erect



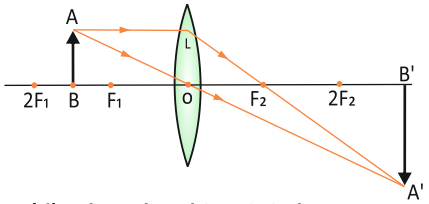
(a) When the object is at Infinity



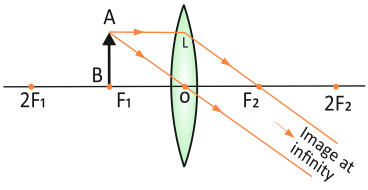
(b) When the object is beyond $2F_1$L



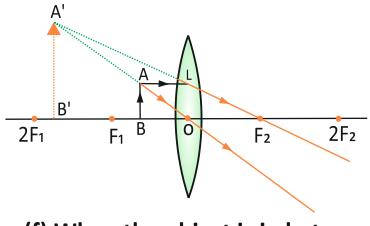
(c) When the object is at $2F_2$



(d) When the object is in between F_1 and $2F_2$



(e) When the object is at focus F_1



(f) When the object is in between focus F_1 and optical centre of the lens

Images formed by convex lens for different positions of the object

Uses of Convex Lenses

Uses of convex lenses are given below:

- Convex lenses are used in cameras of all types except a pinhole camera.
- Convex lenses are used in telescopes and microscopes.
- Convex lenses are used in spectacles to help people see nearby things clearly.

convex lenses are used in telescopes and microscopes

Images Formed by Concave Lens

Concave lens forms different images depending on the position of the object.

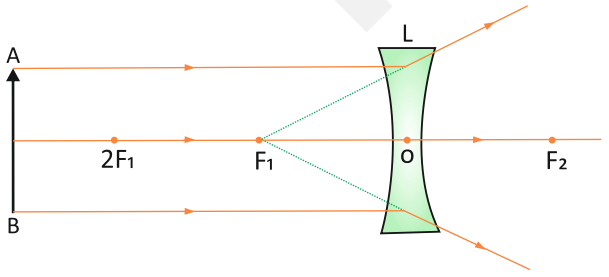
Uses of Concave Lenses

Uses of concave lenses are given below:

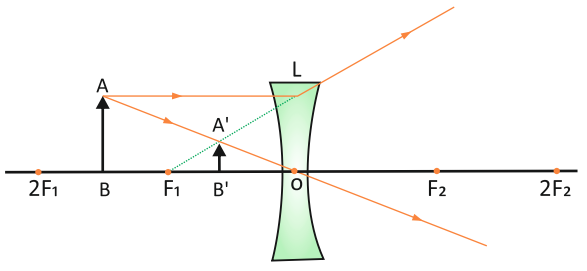
- Concave lens are used in Galileo's telescope.
- Concave lenses are used in spectacles to help people to see the distant objects clearly.

Galileo's telescope

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At focus F_1	Highly diminished, point-sized	Real and inverted
Between infinity and optical centre O of the lens	Between focus F_1 and optical centre O	Diminished	Virtual and erect



(a) When the object is at infinity



(b) When the object lies between infinity and optical centre of the lens

Images formed by concave lens for different positions of the object

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Apply Concept in Context

Apply

- How do lenses focus light, and how is this principle used in devices like glasses and cameras?
- What will happen if the object is placed closer to the focal point of a convex lens?

Skills Covered: Critical thinking, Applicative thinking, Problem-solving

Examine Further

Analyse

What happens to the image formed by a lens when the object is placed beyond the focal point? How does this apply to magnifying glasses or microscopes?

Skills Covered: Analytical thinking, Brainstorming, Research

Self-Assessment Questions

Evaluate

- How does a convex lens differ from a concave lens in terms of image formation?
- What is the focal point of a lens, and how does it influence the image formed?
- How are lenses used in optical instruments like microscopes, cameras, and eyeglasses?

Skills Covered: Observation, Research, Recall

Creative Insight

Create

Lenses manipulate light through refraction to form images, and the position of the object determines the type of image produced.

Task: Draw and label the image formation by convex and concave lenses, indicating the positions of the object and the image formed.

Skills Covered: Creativity, Research, Observation, Brainstorming

Bloom's Taxonomy

SUMMARY

Introduction to Light

- **Definition:** Light is a form of energy that enables vision and travels in waves.
- **Properties:** It moves in straight lines and can be reflected, refracted, or absorbed.

Colours of Light

- **White Light:** A mix of colors (VIBGYOR) that can be separated using a prism.
- **Reflection:** Light bounces off surfaces; angle of incidence = angle of reflection.
- **Refraction:** Light bends when passing between different media due to a change in speed.

Mirrors

Types of Mirror

- **Plane Mirror:** Forms upright, virtual, and same-size images behind the mirror.
- **Curved Mirrors:**
  - **Concave:** Can produce real/inverted or virtual/magnified images.
  - **Convex:** Forms virtual, upright, and smaller images.

Applications: Used in vehicles (convex), makeup mirrors (concave), telescopes, etc.

Lenses

Types of Lenses

- **Convex (Converging):** Forms real, inverted images or virtual, upright, magnified images.
- **Concave (Diverging):** Forms virtual, upright, and diminished images.

Key Concepts in the Study of Light

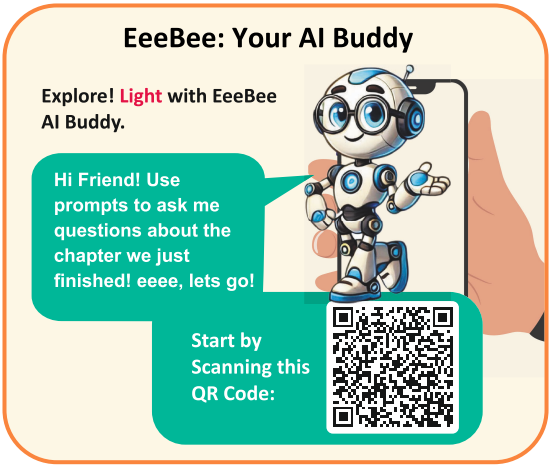
Reflection: Light bounces off surfaces; angle of incidence = angle of reflection.

Refraction: Light bends when passing between media with different refractive indices.

Focal Point & Focal Length: Point where light rays converge (convex) or diverge (concave).

Images:

- **Real Image:** Can be projected, inverted, and varies in size.
- **Virtual Image:** Cannot be projected, always upright, and may be magnified or diminished.



Gap Analyzer™
Take a Test

EXERCISE

That turn curiosity into confidence—let's begin!

A. Choose the correct answer.

1. Which of the following best describes the nature of light?
   (a) It travels in straight lines only ☐ (b) It is made of particles only ☐
   (c) It is made of both waves and particles ☐ (d) It travels in curved lines ☐
2. What happens when light passes through a prism?
   (a) It gets reflected ☐ (b) It gets absorbed ☐
   (c) Refracts into a spectrum ☐ (d) It gets scattered ☐
3. Which is true about concave mirrors?
   (a) Virtual, upright, smaller images ☐ (b) Real, inverted, magnified ☐
   (c) Real, inverted, diminished images ☐ (d) No focal point ☐
4. What image does a convex lens form beyond the focal point?
   (a) Virtual, upright, magnified ☐ (b) Real, inverted, diminished ☐
   (c) Real, inverted, magnified ☐ (d) Virtual, upright, diminished ☐
5. Which of the following is responsible for the formation of a rainbow?
   (a) Reflection of light ☐ (b) Diffraction of light ☐
   (c) Dispersion of light ☐ (d) Refraction of light ☐

B. Fill in the blanks.

1. Light travels in a straight line unless it is _____ or _____ by a medium.
2. A concave mirror is used in _____ for focusing light.
3. The bending of light as it passes from one medium to another is called _____.
4. The primary function of the lens in the human eye is to _____ light and form an image on the retina.
5. Convex mirrors are often used as _____ mirrors due to their ability to provide a wide field of view.

C. Write True or False.

1. Light can travel through a vacuum.
2. A concave lens always forms a real, inverted image.
3. Refraction occurs when light travels from one medium to another with a change in speed.
4. Concave mirrors are used in telescopes and magnifying glasses.

D. Define the following terms.

1. Reflection
2. Refraction
3. Convex Mirror
4. Concave Mirror
5. Lens

E. Match the columns.

Column A	Column B
1. Reflection	(a) The bending of light when it passes through a new medium
2. Refraction	(b) A curved surface that focuses light on a specific point
3. Concave Mirror	(c) A mirror that curves outward and forms diminished, upright images
4. Convex Mirror	(d) The bouncing back of light from a surface
5. Lens	(e) A transparent object that bends light to form an image

F. Give reasons for the following statements.

1. Concave mirrors are used in magnifying glasses and telescopes.
2. Convex mirrors provide a wider field of view.
3. Refraction is the cause of a rainbow's formation.
4. Mirrors always form images by reflection of light.
5. Convex lenses are used to correct farsightedness (hyperopia).

G. Answer in brief.

1. What happens to light when it strikes a surface at an angle?
2. How does a concave mirror form an image?
3. What is the difference between a convex lens and a concave lens?
4. How do mirrors and lenses differ in their ability to form images?
5. How does dispersion of light lead to the formation of a rainbow?

H. Answer in detail.

1. Describe the process of reflection of light, including the laws of reflection.
2. Explain the formation of a rainbow and the role of dispersion and refraction in it.
3. Discuss how concave mirrors are used in everyday applications.
4. Explain the working principle of a convex lens and its uses in daily life.
5. Compare mirrors and lenses in terms of their properties and applications.

NEP Corner

Know about NEP 2020

Vocational Training through Digital Platforms

From Class 6, students can learn vocational skills like coding, entrepreneurship, or agriculture through online platforms and simulations.

Skill-based Activity

Explore the Reflection and Refraction of Light

STEM

Perform the given activity to understand how light behaves under reflection and refraction. You will need a glass of water, a spoon, and a straight straw.

- Place a spoon in a glass of water and observe how the spoon appears bent.
- Place the straight straw in the glass of water and observe how it appears broken.
- Compare the bending of light in both cases and explain how refraction occurs.

Now, answer the following questions:

- What is refraction, and why does it cause the spoon or straw to appear bent?
- How does light behave when it travels from air to water?
- How can refraction be used in magnifying glasses?

Skills Covered: Observation, Analytical thinking, Logical thinking, Brainstorming

3D Model of Light and Optical Devices

Art

Create a 3D model of a concave mirror, convex mirror, and lens using craft materials.

- Show the reflective surfaces for mirrors and transparent material for lenses.
- Label the parts such as focal point, center of curvature, and principal axis.
- Use the model to demonstrate how each device forms an image.

Skills Covered: Creativity, Analytical thinking, Organization, Brainstorming

Light-reflecting materials

Group Activity

Students can collect light-reflecting materials (mirrors, lenses, etc.) and classify them based on how they reflect, refract, or focus light.

They can then experiment by creating a model of each optical device using materials like glass, plastic, or mirrors.

Skills Covered: Critical thinking, Logical thinking, Brainstorming, Collaboration, Social skills

Factors Influencing the Reflection and Refraction of Light

Case to Investigate

Investigate how factors such as the angle of incidence, medium, and shape of a surface affect the reflection and refraction of light.

Compile your findings and present them as a report.

Skills Covered: Critical and analytical thinking, Research, Brainstorming, Investigation, Communication

Sustainable Light Applications

Aligning with SDGs

Discuss how solar panels and fiber optic cables use the properties of light such as reflection and refraction for efficient energy use and communication. Reflect on how these practices address challenges like energy consumption and sustainable technology.

Aligned with SDG 7: Affordable and Clean Energy

Skills Covered: Global awareness, Critical thinking, Research, Analytical thinking, Problem-based thinking

Personalized Light Experiment Design

Integrated Learning

Using your knowledge of light, create an experiment to show how light can be reflected, refracted, or focused by mirrors and lenses. Design an experiment that could be shared with others to explain the principles of light in practical applications.

Consider the materials available to you and the best way to demonstrate the properties of light.

Skills Covered: Applicative thinking, Critical thinking, Research, Brainstorming, Empathy, Emotional intelligence