13
Chapter

Light

We'll cover the following key points:

- Light and its properties
- Human Eye
- Visually Impaired & Braille System

Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 7th we learnt

- Light Travels in a straight line
- Reflection of light

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

Learning Outcomes

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

- Understand and measure angles of incidence and reflection while applying the laws of reflection to explain the behavior of light.
- Explore how images are formed by plane mirrors and explain the phenomenon of lateral inversion.
- Identify the main parts of the human eye, understand their functions, and learn how images are processed by the eye.

Teaching Strategies for Educators

To make the learning process engaging and effective, teachers can:

- **Use Practical Examples:** Demonstrate concepts like reflection using plane mirrors and water surfaces, highlighting the visibility of non-luminous objects.
- **Incorporate Visual Aids and Experiments:** Use diagrams, hands-on activities, and real-world examples to explain image formation and the functions of the human eye.
- **Encourage Group Discussions:** Facilitate group interactions to help students analyze concepts like accommodation and common vision defects.

NCF Curricular Goals and Competencies

- CG-2 (C) 2.4): Examines the physical world in scientific and mathematical contexts.
- CG-6 (C) 6.1): Enhances understanding through exploration, scientific inquiry, and experimentation.

Mind Map

LIGHT

Introduction & Laws of Reflection

i. **Light makes Things Visible**

ii. **Laws of Reflection**

- The incident ray, the normal at the point of incidence and the reflected ray all lie in the same plane.
- The angle of incidence is always equal to the angle of reflection.

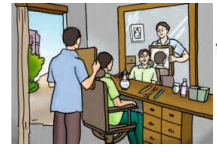
NOTE: An image formed by a mirror the left of the object appears on the right and the right appears on the left. This is known as lateral inversion

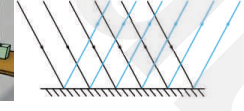
Multiple Reflection & Images

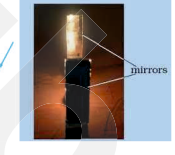
Mirror at the hair dresser shop

Image in plane mirror parallel to each other

Kaleidoscope:- A kaleidoscope is a cylindrical tube with mirrors and colorful objects inside, creating ever-changing, symmetrical patterns when you look through it.







Care of the Eyes

If advised, use suitable spectacles

Do not look at the Sun or a powerful light directly.

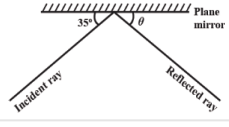
Never rub your eyes. If particles of dust go into your eyes, wash your eyes with clean water.

Do not read by bringing the book too close to your eyes or keeping it too far.

Types of Reflection

Regular Reflection :- Reflection from a smooth sur face like that of a mirror is called regular reflection.

Diffused Reflection :- When parallel rays reflect unevenly, it's called diffused or irregular reflection.



Sunlight & Our Eyes

Sunlight

The sunlight is referred to as white light.

Splitting of light into its colours is known as dispersion of light. **Ex**: Rainbow

Our Eyes

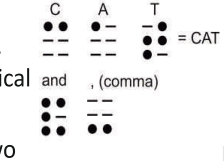
The lens focuses light on the back of the eye, on a layer called retina.

Visually Impaired & Braille System

Visually Impaired Persons Can Read and Write by Non-optical and optical aid.

Braille System

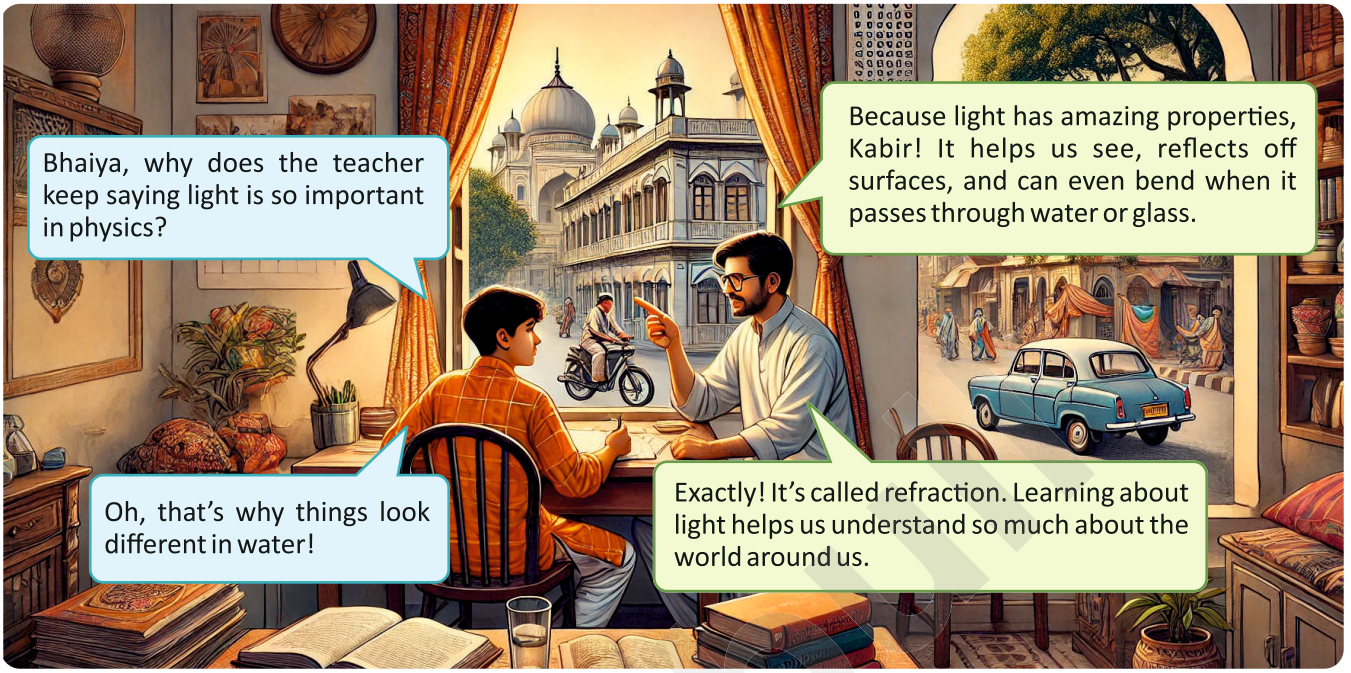
- Braille is a system developed by Louis Braille in 1821.
- Braille system has 63 dot patterns or characters.
- Each character represents a letter, a combination of letters, a common word or a grammatical sign.
- Dots are arranged in cells of two vertical rows of three dots each.



Based on NCERT*

Light and Its Properties

Rohan is doing his homework when his younger brother, Kabir, walked in.



We have already learnt about the different phenomena related to light. Light enables us to see the different objects around us. Let us try to understand the visibility of objects.

What Makes Things Visible

Light is a form of energy which when it falls on our eyes from an object either by emission or by reflection, causes the sensation of vision in our eyes and makes the object visible.

Light is that factor which makes objects visible. Luminous objects like sun, lighted candle or glowing bulb emit light which enters our eyes and the non-luminous objects like book, pen, trees, mountain,

In History...

The study of light advanced significantly from ancient times, particularly in the 17th century. Christiaan Huygens proposed the wave theory in 1678, suggesting that light travels in waves, while Isaac Newton introduced the particle theory, arguing that light consists of tiny particles called "corpuscles."

This sparked a long debate until the 19th century, when experiments by Thomas Young and Augustin-Jean Fresnel confirmed the wave nature of light. In the early 20th century, Albert Einstein's work on the photoelectric effect demonstrated light's particle-like behavior, leading to the modern understanding of light as both a wave and a particle.

KEYWORDS

Luminous Objects: Objects that emit their own light.

Photoelectric Effect: The emission of electrons from a material's surface when exposed to light of sufficient frequency.

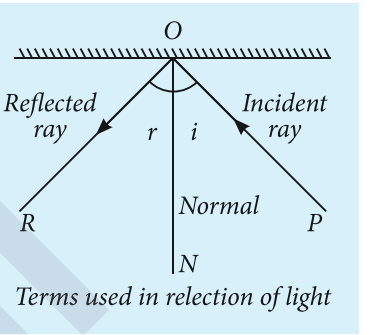
table, chair and the countless objects around us when reflect light falling on them and when the reflected light enters our eyes, then our sense of vision is enabled to see the objects.

It means that eyes alone cannot see any object. It is only when light from an object enters our eyes that we see the object. The light may have been emitted by the object, or may have been reflected by it. Since class six, we have been learning about the reflection of light. Let 's recall.

Reflection of Light

Reflection of light may be defined in the following ways.

- The phenomenon in which a ray of light after falling on a smooth polished surface or a mirror returns to the same medium is called reflection.
- The change in the direction of light when it falls on any smooth polished shining surface is called reflection of light.
- The phenomenon of returning back of some of the parts of light ray which falls on a smooth polished shining surface is known as reflection of light.



Terms used in relection of light

In continuation, let us learn something more about the reflection of light.

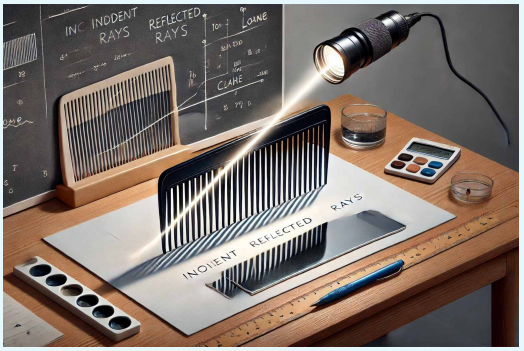
Terms used in reflection of light

We should know about some terms used in reflection of light.

Terms used in Reflection of Light

Incident ray	Light which falls on the surface of a reflecting material is known as incident ray. From the figure given here PO is incident ray.
Reflected ray	Light which turns back in the same medium after reflection is called reflected ray. From the figure given here OR is reflected ray.
Point of incidence	The point at which the light ray strikes the reflecting surface is called the point of incidence.
Normal	The perpendicular line drawn from the point of incidence on the reflecting surface is called normal. In the figure, it is denoted by ON.
Angle of incidence	The angle formed between the incident ray PO and normal ON is the angle of incidence. In figure, it is denoted by angle i.
Angle of reflection	The angle formed between the reflected ray OR and the normal ON is the angle of reflection. In figure, it is shown by angle r.

Activity



To understand the incident and reflected ray

This activity requires a white sheet of paper, a strip of black paper, a drawing board or a table, a comb, a torch and a mirror.

Procedure : Let us proceed as per the following steps.

- Fix the white sheet of paper on the drawing board or table.
- Close all the openings of the comb except one in the middle by using the strip of black paper.
- Hold the comb perpendicular to the sheet of paper.
- Throw light from a torch through the opening of the comb from one side. With slight adjustment of the torch and the comb, you will see a ray of light along the paper on the other side of the comb.
- Keep the comb and the torch steady. Place a strip of plane mirror in the path of the light ray.

Observation : After striking the mirror, the ray of light is reflected in another direction.

Conclusion :

- The light ray, which strikes any surface, is called the incident ray.
- The ray that comes back from the surface after reflection is known as the reflected ray.

Activity

To understand the point of incidence, normal, angle of incidence and angle of reflection

- In the above activity, draw lines showing the position of the plane mirror, the incident ray and the reflected ray on the paper with the help of your friends.
- Remove the mirror and the comb.
- Draw a line making an angle of 90º to the line representing the mirror at the point where the incident ray strikes the mirror.

Arrangement for showing reflection

Conclusion :

- This line is known as the normal to the reflecting surface at that point.
- The angle between the normal and incident ray is called the angle of incidence (i).
- The angle between the normal and the reflected ray is known as the angle of reflection (r).

Laws of Reflection : There are two laws of reflection which are stated as follows:

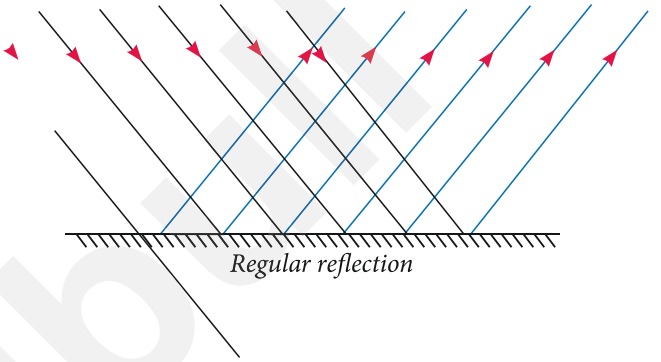
1. Angle of incidence is always equal to angle of reflection $\angle i = \angle r$
2. Angle of incidence, angle of reflection, and the normal at the point of incidence all lie in the same plane.

Special cases :

- If the incident ray is normal to the plane of the mirror, then the reflected ray coincides with the incident ray, i.e. it retraces its path.
- If the angle of incidence is 45°, then the angle between the incident and refracted rays will be 90°.

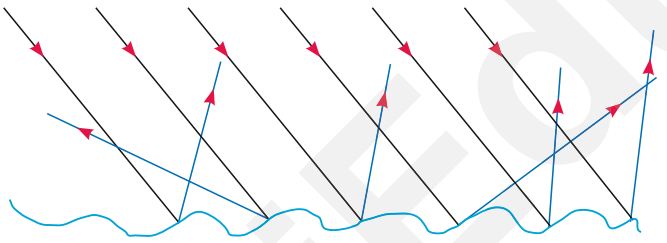
Regular and irregular reflection

If a beam of parallel rays falls on a smooth well-polished surface (e.g, a plane mirror), then the reflected rays are also parallel to each other. When these reflected parallel rays are received by the eye, they produce a 'glare'. This kind of reflection is known as regular or specular reflection.



Regular reflection

A reflecting surface such as a wall is not smooth. It contains a large number of irregularities. When a beam of parallel rays falls on such a rough surface, the reflected rays are not parallel to each other. This is because due to irregularities on the surface, each incident ray will have a different angle or incidence. This will cause each ray of light to be reflected at a different angle. Thus, the reflected rays are scattered in different directions. This kind of reflection is known as irregular, or diffused reflection.



Irregular reflection

It is the irregular or diffused reflection that enables us to see objects without a glare. It must be noted here that the laws of reflection are followed in all kinds of reflection.

Did you know

Light travels incredibly fast (about 300,000 kilometers per second in a vacuum), can actually slow down when passing through different materials? For example, when light moves through water, it slows down to around 300,000 kilometers per second, and in glass, it slows even further to about 200,000 kilometers per second!

Light is not just fast—it's also versatile! It behaves both as a wave (like ripples on water) and as particles (called photons), a dual nature that makes it one of the most intriguing elements in physics.

Formation of Image by a Plane Mirror

Perform the following activity to understand the image formation by a plane mirror.

Activity

Formation of image by a plane mirror

A source of light O is placed in front of a plane mirror PQ. Two rays OA and OC are incident on it. Can you find out the direction of the reflected rays?

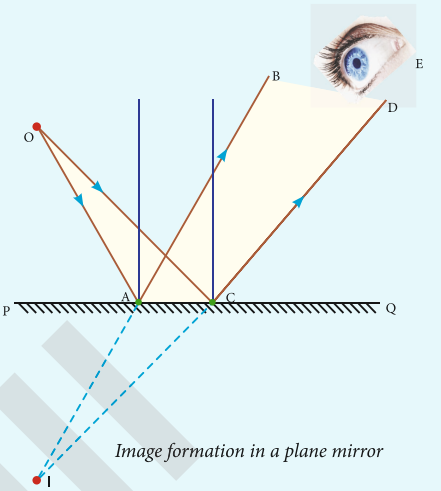


Image formation in a plane mirror

Draw normal to the surface of the mirror PQ, at the points A and C. Then draw the reflected rays at the points A and C. How would you draw these rays? Call the reflected rays AB and CD, respectively. Extend them further. Do they meet? Extend them backwards. Do they meet now? If they meet, mark this point as I. For a viewer's eye at E , do the reflected rays appear to come from the point I. Since the reflected rays do not actually meet at I, but only appear to do so, we say that a virtual image of the point O is formed at I. As you have learnt already in Class VII, such an image cannot be obtained on a screen.

You may recall that in an image formed by a mirror, the left of the object appears on the right and the right appears on the left. This is known as **lateral inversion**.

Characteristics of image formed by a plane mirror

Virtual	Image formed by a plane mirror is always virtual because it cannot be obtained on a screen.
Erect	Image formed by a plane mirror is always erect, i.e. upright.
Of same size	It is always of the same size as that of object.
At same distance	It is always at the same distance behind the mirror as the distance of the object in front of the mirror.
Laterally inverted	Image formed by a plane mirror is always laterally inverted, i.e. the side of the object gets inverted in the image.

Thus, the image formed by a plane mirror is virtual, erect, of the same size as that of object, at the same distance behind the mirror and laterally inverted to the object.

Multiple Reflections

Reflected light can be reflected again

We visit a barber's shop regularly for a hair cut. After cutting the hair, the barber place a mirror behind our head to show the reflection of the hair cut on the back of our head. The reflection of the hair on the back of our hair is reflected again in the reflected kept in front of us. This shows that the reflected light gets reflected again. We can also see that many images for the image on the back mirror are

Mirror at the hair dresser shop

formed on the front mirror. The phenomena of a ray of light being reflected more than once is called multiple reflections. The number of images formed depends on the angle between the two mirrors. If two mirrors make an angle of Q between them and the object is placed in between the two mirrors and the number of images is *n* then,

$$n = \frac{360^0}{\theta} - 1$$

$$\text{If } \theta \text{ is } 0^0, \text{the number of images } (n) = \frac{360^0}{0} - 1 = \text{infinite}$$

$$\text{If } \theta \text{ is } 90^0, \text{the number of images } (n) = \frac{360^0}{90^0} - 1 = 3$$

Periscope

Periscopes are used in submarines to get the image of the outer world from inside the submarines. A periscope is made on the principle of multiple reflection.

Multiple Images

We know that a plane mirror forms only a single image of an object. If we use more than one mirror, multiple images is formed. The number of images (n) formed by mirrors kept at θ angle with each other is given by n = (360/θ) - 1

Kaleidoscope

A kaleidoscope is a tube of mirrors containing loose coloured objects such as glass pieces or beads. The light enters from the end containing the coloured objects and gets reflected. This light is further reflected multiple times by the mirrors inside the tube and family enters the eye placed at the other end of the tube. As the mirrors are hinged, multiple images of an object are created. The combination of these multiple images forms a variety of patterns.

Dispersion of Light

When white light passes through a glass prism, it splits into seven colours – violet, indigo, blue, green, yellow, orange and red, *i.e.*, VIBGYOR. This phenomenon is called dispersion. Thus, the phenomenon of splitting of light into seven colours- violet, indigo, blue, green, yellow orange and red- is known as dispersion of light. Dispersion was first observed by Sir Isaac Newton when he passed white light through a glass prism.

Cause of Dispersion

Cause of dispersion is that a transparent medium like a glass prism bends or deviates different colours of light by different amounts. The deviation is maximum for violet and minimum for red. When white light passes through a prism, its constituent light having different colours deviates by different angles and hence we get the spectrum of seven colours.

Let's recall what we know

Apply Concept in Context

Apply

1. Why do you think a shadow forms when an object blocks the light?
2. Why do objects appear different in color when viewed under different lights, such as sunlight and artificial light?

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Examine Further

Analyse

1. Explain how light travels in a straight line and provide examples where this property is observed.
2. Why does a straw in a glass of water appear bent when viewed from the side? Discuss this phenomenon.

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Self-Assessment Questions

Evaluate

1. What is light? List two key properties of light.
2. How does reflection of light help us see objects around us?

Skills Covered: Reflective thinking, critical thinking, knowledge recall

Creative Insight

Create

Conduct an experiment to demonstrate the refraction of light:

1. Fill a glass with water and place a pencil inside it.
2. Observe how the pencil appears bent at the water's surface.
3. Record your observations and explain how refraction causes this effect.

Write your observations and conclusions in your notebook, linking them to the properties of light.

Skills Covered: Creativity, digital-age literacy, critical and logical thinking

SCAN TO ACCESS

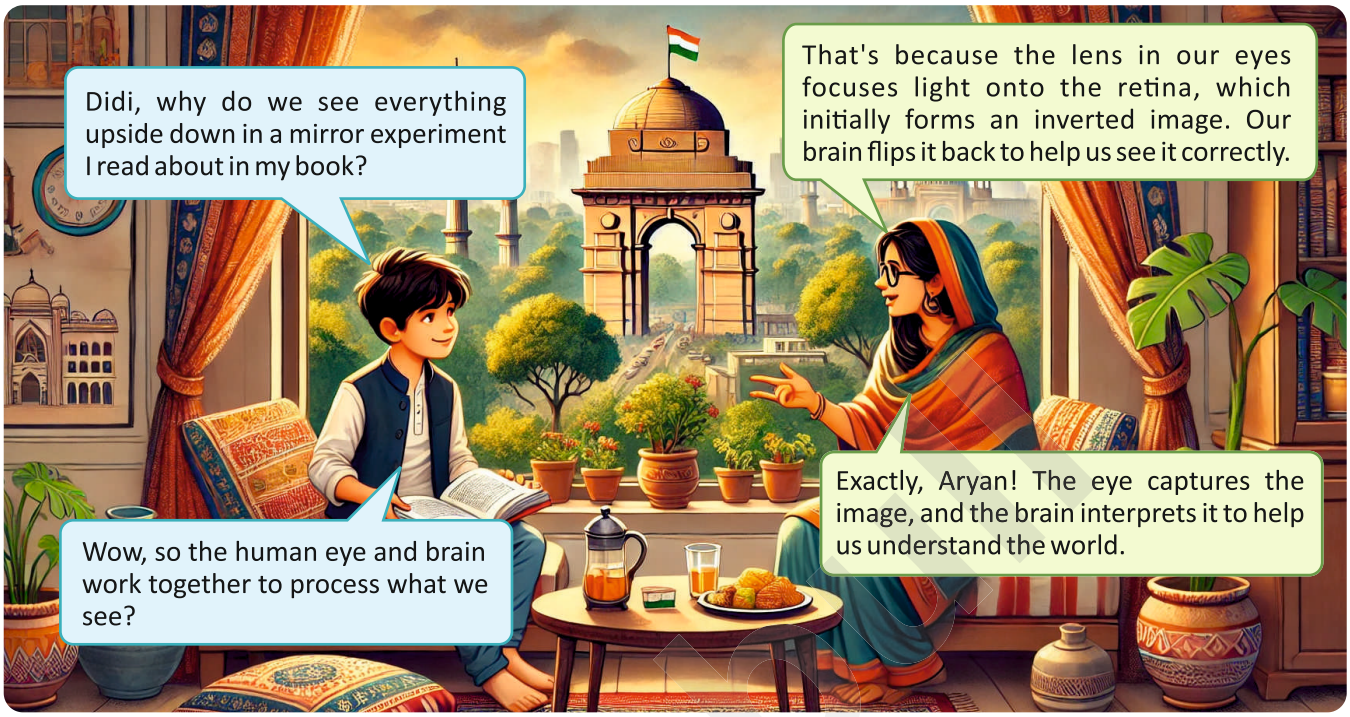
Take a Task

Watch Remedial

Bloom's Taxonomy

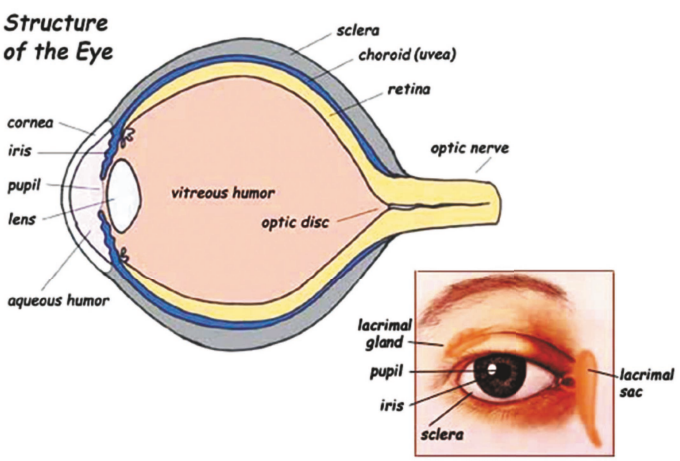
Human Eye

Aryan is sitting on the sofa reading a science book when his cousin, Neha, joins him.



Structure of Eyes

Eye is one of the most important sense organs which enable us to see the things around us. Visibility of objects becomes possible when light coming from an object, either by emission or reflection, enters our eyes. It is, therefore, important to understand the structure and working of eyes.



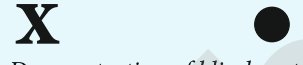
- The eye has a roughly spherical shape. Outer coat of the eye is white. It is tough so that it can protect the interior of the eye from accidents.
- Its transparent front part is called cornea.
- Behind the cornea, we find a dark muscular structure called iris.
- In the iris, there is a small opening called the pupil. The size of the pupil is controlled by the iris.
- The iris is the part of that eye which gives it its distinctive colour. When we say that a person has green eyes, we refer actually to the colour of the iris. The iris controls the amount of light entering into the eye.

Blind spot :

At the junction of the optic nerve and the retina, there are no sensory cells, so no vision is possible at that spot. This is called the blind spot. Its existence can be demonstrated as follows:

Activity

- Make a round mark and a cross on a sheet of paper with the spot to the right of the cross. The distance between two marks may be 6-8 cm.
- Hold the sheet of paper at arms length from the eye. Close your left eye. Look continuously at the cross.
- Move the sheet slowly towards you, keeping your eye on the cross. What do you find? Does the round mark disappear at some point?
- Now close your right eye. Look at the round mark now and repeat the activity. Does the cross disappear?
- The disappearance of the cross or the round mark shows that there is a point on the retina which cannot send messages to the brain when light falls on it.



Demonstration of blind spot

The impression of an image does not vanish immediately from the retina. It persists there for about 1/16th of a second. So, if still images of a moving object are flashed on the eye at a rate faster than 16 per second, then the eye perceives this object as moving.

The movies that we see are actually a number of separate pictures in proper sequence. They are made to move across the eye usually at the rate of 24 pictures per second (faster than 16 per second). So, we see a moving picture.

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Normal vision

Nature has provided eyes with eyelids to protect from any object entering the eye. Eyelids also shut out light when not required. Eye is such a wonderful instrument that it can see distant objects as well as near objects clearly. The minimum distance at which the eye can see objects distinctly varies with age. The most comfortable distance at which one can read with a normal eye is about 25 cm.

Myopia or short sightedness

Some persons can see near objects clearly but cannot see distant objects so clearly. This defect is known as myopia or short sightedness. Myopia can be corrected by using a spectacle made from concave lenses of suitable focal length.

Hypermetropia or long sightedness

Some persons cannot see near objects clearly but they can see distant objects quite well. This defect is known as hypermetropia or long sightedness. Hypermetropia can be corrected by using a spectacle made from convex lenses of suitable focal lengths.

Cataract : Sometimes, particularly in old age, eyesight becomes foggy. It is due to the eye lens becoming cloudy. When this happens, persons are said to have cataract. There is a loss of vision, sometimes extremely severe. It is possible to treat this defect. The opaque lens is removed and a new artificial lens is inserted. Modern technology has made this procedure simpler and safer.

Care Of Eyes

It is necessary that you take proper care of your eyes. If there is any problem, you should go to an eye specialist. Have a regular checkup.

- Do not look at the sun or a powerful light directly.
- Too little or too much light is bad for eyes. Insufficient light causes eyestrain and headaches. Too much light, like that of the sun, a powerful lamp or a laser torch can injure the retina.
- If advised, use suitable spectacles.
- Always read at the normal distance for vision. Do not read by bringing your book too close to your eyes or keeping it too far.
- Wash your eyes frequently with clean water.
- Never rub your eyes. If particles of dust go into your eyes, wash your eyes with clean water. If there is no improvement, go to a doctor.

Did you know

Noctural animals have eyes which collect maximum portion of dim light. In owls, there is a huge retina to do so. Many animals have a special reflecting membrane behind the retina which reflects light rays that have missing hutting a rod cell. This membrane is responsible for the glow you see in an animal's eye and when light shines on it.

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

Apply Concept in Real-Life Context

Apply

1. Why do you think we cannot see in complete darkness even though our eyes are open?
2. Why do objects appear blurry when we try to look at them underwater without goggles?

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Examine Further

Analyse

1. Explain how the lens in our eye changes shape to focus on objects at different distances.
2. Why do some people need glasses to see clearly, and how do glasses help correct their vision?

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Self-Assessment Questions

Evaluate

1. What is the function of the retina in the human eye?
2. Define accommodation in the context of the human eye.
3. What are rods and cones, and how do they contribute to our vision?
4. Name and explain two common eye defects and how they can be corrected.

Skills Covered: Reflective thinking, critical thinking, knowledge recall

Creative Insight

Create

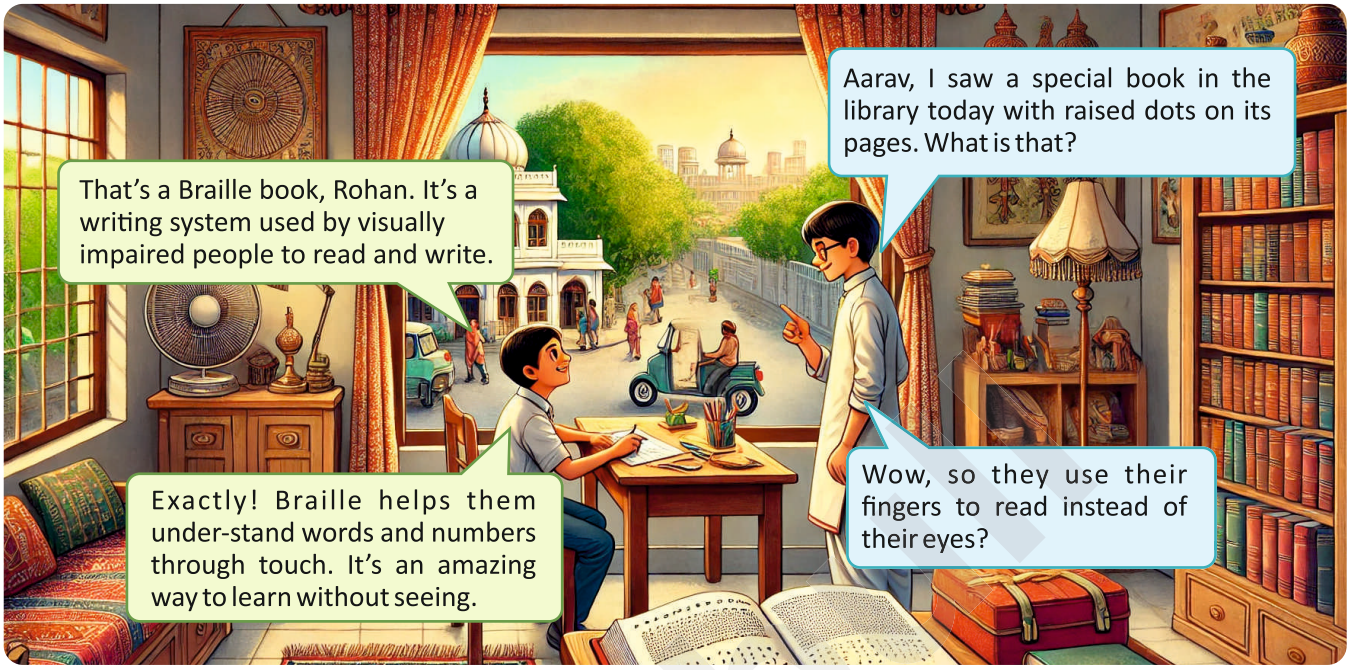
Conduct an experiment to understand how the pupil reacts to light:

1. Take a small flashlight and shine it near your eye in front of a mirror (without directly pointing it into the eye).
2. Observe how your pupil size changes when exposed to light and when in the dark.
3. Note your observations and write down why the pupil reacts in this way.

Skills Covered: Creativity, observation, critical and logical thinking, brainstorming, applicative thinking

Visually Impaired & Braille System

Aarav is doing homework when his friend, Rohan, visits him.



Visually Challenged Persons Can Read And Write

Some persons, including children, can be visually handicapped. They have very limited vision to see things. Some persons cannot see at all since birth. Some persons may lose their eyesight because of a disease. Such persons try to identify things by touching and listening to voices more carefully. They develop their other senses more sharply. However, additional resources can enable them to develop their capabilities further.

What Is A Braille System?

The most popular resource for visually challenged persons is known as Braille.

The present system was adopted in 1932. There is Braille code for common languages, mathematics and scientific notation. Many Indian languages can be read using the Braille System. Louis Braille, himself a visually challenged person, developed a system for visually challenged persons and published it in 1821.

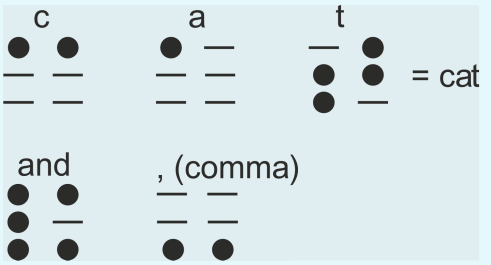
Louis Braille

KEYWORDS

Visually handicapped: Visually handicapped refers to individuals who have partial or complete loss of vision, affecting their ability to see.

Braille system has 63 dot patterns or characters. Each character represents a letter, a combination of letters, a common word or a grammatical sign. Dots are arranged in cells of two vertical rows of three dots each.

Patterns of dots to represent some English alphabets and some common words are shown below.



Example of dot patterns used in Braille System

These patterns when embossed on Braille sheets help visually challenged to recognise words by touching. To make them easier to touch, the dots are raised slightly.

Visually challenged people learn the Braille system by beginning with letters, then special characters and letter combinations. Methods depend upon recognition by touching. Each character has to be memorised. Braille texts can be produced by hand or by machine. Type writer - like devices and printing machines have now been developed.

Some visually challenged Indians have great achievements to their credit. Diwakar, a child prodigy, has given amazing performances as a singer.

Many visual challenged person have great achievents to their credit. Let us know about them: Mr. Ravindra Jain, born completely visually challenged, obtained his Sangeet Prabhakar degree from Allahabad. He has shown his excellence as a lyricist, singer and music composer.

Mr. Lal Advani, himself visually challenged, established an Association for special education and rehabilitation of disabled in India. Besides, he represented India on Braille problems to UNESCO.

Helen A Keller, an American author and lecturer, is perhaps the most well known and inspiring visually challenged person. She lost her sight when she was only 18 months old. But because of her resolve and courage she could complete her graduation from a university. She wrote a number of books including. **The Story of My Life** (1903).


Helen A. Keller

Let's recall what we know

SCAN TO ACCESS

Take a Task

Watch Remedial

Bloom's Taxonomy

Apply Concept in Real-Life Context

Apply

1. Why do you think visually impaired individuals rely on touch for reading and writing instead of sight?
2. How does the Braille system help visually impaired people in their daily lives?

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Examine Further

Analyse

1. How does learning Braille empower visually impaired individuals to gain education and independence?
2. Why do you think Braille books are designed with raised dots instead of printed letters?

Skills Covered: Critical and logical thinking, brainstorming, applicative thinking

Self-Assessment Questions

Evaluate

1. What is Braille, and how is it different from regular written language?
2. How does the sense of touch play a vital role in understanding Braille?
3. Name two tools or devices that assist visually impaired individuals in reading or writing.
4. Explain how technology has improved accessibility for visually impaired individuals.

Skills Covered: Reflective thinking, critical thinking, knowledge recall

Creative Insight

Create

Design an activity to understand how Braille works:

1. Take a blank sheet of paper and draw a grid with dots to represent Braille letters.
2. Try spelling out your name using the Braille alphabet by creating raised dots (e.g., using glue or a similar material).
3. Close your eyes and attempt to read it by touching the dots.

Write your observations and conclusions in your notebook, describing your experience of **"reading"** through touch.

Skills Covered: Creativity, observation, critical and logical thinking, brainstorming, applicative thinking

SUMMARY

Light & Its Properties

1. Nature of Light: Light is a form of energy that travels in straight lines as electromagnetic waves. It enables us to see and interacts with materials in various ways.

2. Reflection: When light hits a smooth surface, it bounces back. This is how mirrors work, creating images based on the angle of reflection.

3. Refraction: Light bends when passing from one medium to another (like air to water), changing its speed and direction. This property explains phenomena like the bending of a straw in water.

4. Dispersion: White light splits into its seven constituent colors (VIBGYOR) when passing through a prism. This is why rainbows appear after rain.

5. Absorption and Transmission: Materials can absorb some light and transmit or reflect the rest, which determines their color and opacity.

The Human Eye

1. Structure: The eye is made up of parts like the cornea, lens, retina, iris, and optic nerve, each playing a role in focusing light and transmitting visual information to the brain.

2. How We See: Light enters the eye through the cornea and lens, forming an image on the retina. The retina converts light into electrical signals sent to the brain via the optic nerve.

3. Adaptation: The eye adjusts to different light conditions using the iris, which controls the size of the pupil, allowing more or less light to enter.

4. Common Vision Issues: Problems like nearsightedness, farsightedness, and astigmatism occur due to incorrect focusing of light on the retina. These can often be corrected with glasses or lenses.

Visually Impaired & Braille System

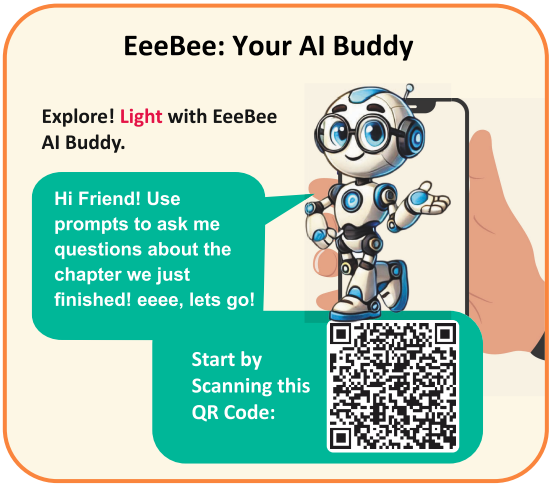
1. Visually Impaired: Visual impairment ranges from partial vision loss to complete blindness, affecting daily activities and independence. Early detection and assistive technologies help manage these challenges.

2. The Braille System: A tactile writing system that allows visually impaired people to read and write using raised dots representing letters, numbers, and symbols.

3. History of Braille:

- Invented by Louis Braille in 1824, inspired by "night writing" developed for soldiers.
- It revolutionized education and communication for blind individuals, enabling greater literacy and independence.

4. Modern Developments: Braille has been adapted for various languages and includes notation for math, music, and computing. Innovations like refreshable Braille displays make digital text accessible to the visually impaired.



Gap Analyzer™
Take a Test

EXERCISE

That turn curiosity into confidence—let's begin!

A. Choose the correct answer.

1. Which property of light explains why shadows are formed?
   (a) Light travels in straight lines ☐ (b) Light bends around objects ☐
   (c) Light splits into colors ☐ (d) Light is absorbed by surfaces ☐
2. The ability of an eye to focus on both distant and nearby objects is called:
   (a) Reflection ☐ (b) Accommodation ☐
   (c) Absorption ☐ (d) Vision ☐
3. Which of the following devices uses Braille to help visually impaired individuals?
   (a) Hearing aids ☐ (b) Magnifying glasses ☐
   (c) Refreshable Braille display ☐ (d) White canes ☐
4. Which part of the human eye controls the amount of light entering the eye?
   (a) Retina ☐ (b) Lens ☐
   (c) Iris ☐ (d) Cornea ☐
5. The raised dots in the Braille system are used to represent:
   (a) Numbers ☐ (b) Letters ☐
   (c) Symbols ☐ (d) All of the above ☐

B. Fill in the blanks.

1. Light always travels in a _____ line.
2. The part of the eye where the image is formed is the _____.
3. Braille was developed by _____ for visually impaired individuals.
4. The size of the _____ adjusts to control the light entering the eye.
5. _____ devices like white canes and screen readers help visually impaired individuals in daily life.

C. Write True or False.

1. The retina is responsible for focusing light in the human eye. _____
2. Light requires a medium to travel. _____
3. Braille uses patterns of raised dots to enable reading by touch. _____
4. The iris determines the color of the eye and controls the size of the pupil. _____

D. Define the following terms.

1. Accommodation
2. Pupil
3. Braille System
4. Visually Impaired
5. Shadow

E. Match the columns.

Column A	Column B
1. Retina	(a) Controls light entry
2. Iris	(b) Raised dot reading
3. Pupil	(c) Image formation
4. Lens	(d) Focus adjustment
5. Braille System	(e) Visually impaired aid

F. Give reasons for the following statements.

1. Light helps us see objects.
2. The human eye adjusts to different levels of light.
3. The Braille system is an essential tool for visually impaired people.
4. Shadows form when an opaque object blocks light.
5. The iris changes the pupil size in bright and dim light conditions.

G. Answer in brief.

1. How does the iris control the amount of light entering the eye?
2. What is the significance of the Braille system for visually impaired individuals?
3. How does light help us see objects around us?
4. What is the role of assistive devices in helping visually impaired people?
5. Explain why shadows are darker on sunny days compared to cloudy days.

H. Answer in detail.

1. Explain the properties of light and how they affect everyday life.
2. Describe the structure of the human eye and the function of each part.
3. How does the Braille system work, and why is it important for visually impaired individuals?
4. Discuss the challenges faced by visually impaired people and the technologies that support them.
5. What are the differences between visually impaired and blind individuals, and how can society make the world more inclusive for them?

NEP Corner

Know about NEP 2020

21st Century Skills!

The policy focuses on coding, data science, AI, robotics, and entrepreneurship, ensuring you are future-ready.

Skill-based Activity

Activity Time

STEM

Understanding Light and its Properties

1. Create a chart illustrating the different properties of light (reflection, refraction, dispersion, and absorption) with examples from daily life.
2. Conduct a simple experiment: Shine light on different surfaces (smooth, rough, colored) and observe how the light behaves.
3. Write a brief explanation of how light enables us to see objects around us.

Skills Covered: Creativity, Observation, Critical Thinking, Logical Reasoning, Reflective Thinking

Exploring Shadows and Light Behavior

Art

Research and Analyze

1. Define shadows and explain how they are formed. Provide real-life examples of when shadows are useful.
2. Research the concept of reflection and discuss its role in daily life, such as in mirrors or calm water surfaces.
3. Compare the behavior of light on smooth versus rough surfaces and explain the phenomenon of diffused and regular reflection.
4. Suggest practical ways to optimize the use of reflective surfaces in homes or workplaces for better lighting.

Skills Covered: Research, Analytical Thinking, Logical Reasoning, Problem-Solving

Light in Nature

Group Activity

1. Research how light plays a crucial role in natural phenomena like rainbows, photosynthesis, and the color of the sky.
2. Create a presentation explaining how light is essential for the survival of life on Earth.
4. Share your findings with the class through a creative medium, such as a video, skit, or poster.

Skills Covered: Research, Collaboration, Communication, Creativity, Critical Thinking

Light and Visually Impaired Individuals

Case to Investigate

1. Investigate the challenges faced by visually impaired individuals in interacting with their surroundings.
2. Write about how the Braille system helps the visually impaired navigate and communicate effectively.
3. Create an infographic showing the role of tactile aids like Braille books, maps, and signboards.
4. Discuss how light-based technologies, such as screen readers or infrared sensors, are used to assist visually impaired individuals.

Skills Covered: Research, Problem-Solving, Creativity, Empathy

Applications of Light for the Visually Impaired

Aligning with SDGs

1. Research technologies that use light to assist visually impaired individuals, such as Braille e-readers or smart canes.
2. Investigate how tactile paving and illuminated signs enhance mobility for visually impaired people in public spaces.
3. Design a model or concept using light-based technology to improve accessibility for visually impaired individuals.

Align these efforts with SDGs:

SDG 3: Good Health and Well-being (Promoting mental and physical well-being through assistive technologies). SDG 4: Quality Education (Ensuring inclusive education with tools like Braille e-readers). SDG 9: Industry, Innovation, and Infrastructure (Developing innovative solutions for accessibility). SDG 11: Sustainable Cities and Communities (Creating inclusive spaces for visually impaired individuals).

Skills Covered: Analytical Thinking, Creativity, Communication, Logical Reasoning

Concern for Globe

Integrated Learning

1. How does light travel, and why does it bend when passing from air into water?
2. Explain how the human eye forms an image of an object. What role does the lens play in focusing light?
3. What challenges do visually impaired individuals face in identifying objects around them, and how does the Braille system help them read and write effectively?

Integrated Learning: Environmental Science

Skills Covered: Brainstorming, Research, Investigation, Critical Thinking