

How Do Our Eyes Help Us See?

- We understand the world mostly through our senses.
- Sight is one of the most important senses.
- With eyes, we can see mountains, rivers, trees, people, and even stars and clouds.
- Words printed on a page are also seen because of eyes!

Think About It:

- How do our eyes actually make us see things?
- What is the role of light?

13.1 What Makes Things Visible?

- Eyes alone are not enough to see objects.
- We can see something only when light from the object enters our eyes.
- The light may come directly (object emits light) or by reflection (object reflects light).

Activity: How Light Travels and Reflects

Materials Needed:

- White sheet of paper
- Drawing board/table
- Comb
- Black paper strip
- Torch
- Plane mirror

Steps:

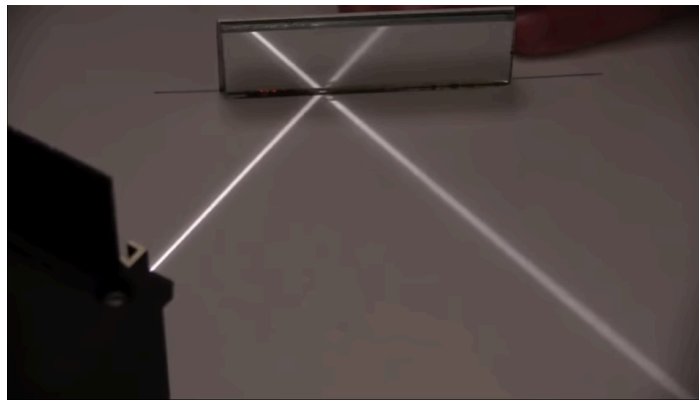
1. Fix paper on board.
2. Cover all comb gaps except one with black paper.
3. Shine torch through the open gap.
4. Adjust to see a thin ray on the paper.
5. Place a plane mirror in the path.

What to Observe:

- After hitting the mirror, the ray changes direction.

Key Points:

- Incident Ray: Light hitting the mirror.
- Reflected Ray: Light bouncing off the mirror.



Drawing Rays and the Normal

- Draw mirror, incident ray, and reflected ray.
- At the point where the incident ray hits, draw a normal (90° line).



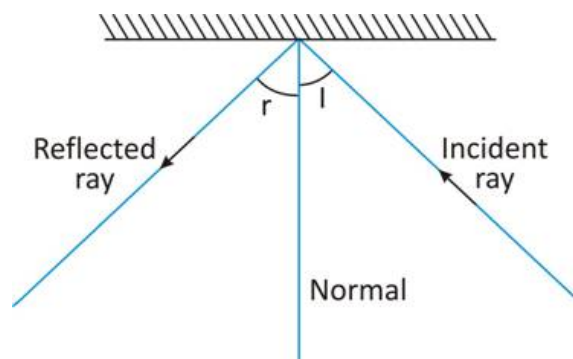
Drawing the normal

Angles in Reflection

- Angle of Incidence ($\angle i$): Between incident ray and normal.
- Angle of Reflection ($\angle r$): Between reflected ray and normal.

Laws of Reflection:

- $\angle i = \angle r$



Activity 13.2 – Bending the Reflected Ray

Steps:

1. Repeat Activity 13.1 with chart paper hanging beyond the table edge.

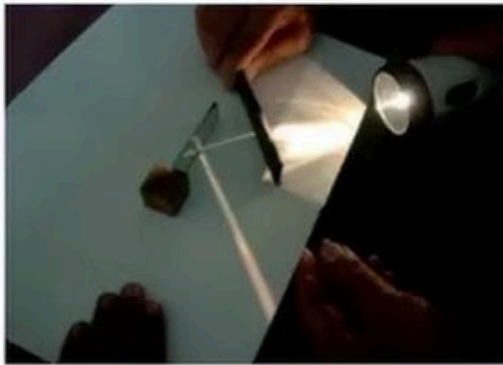
2. Cut a slit and allow reflected ray to fall on hanging part.
3. Bend the paper.

What Happens:

- Reflected ray disappears when paper is bent.
- Reflected ray comes back when paper is straight.

Conclusion:

- Incident ray, normal, and reflected ray must lie in the same plane.



 This is the Second Law of Reflection.

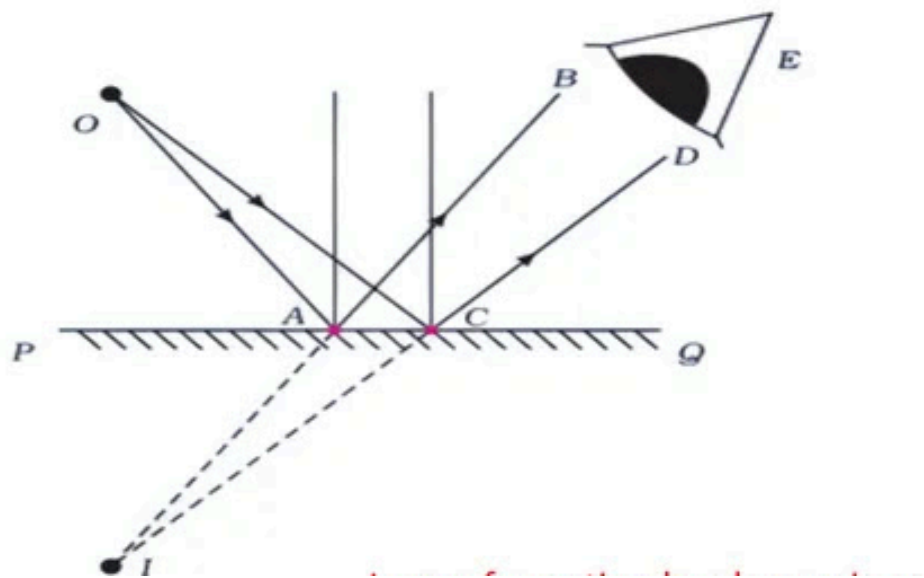
Using Sunlight:

- Activities can be repeated with sunlight instead of torch.

Activity 13.3 – Formation of Image in Mirror

Steps:

1. Place a light source O in front of a mirror PQ.
2. Draw two rays OA and OC towards the mirror.
3. Draw normals at points A and C.
4. Draw reflected rays AB and CD.



🔍 What to Observe:

- Extend the reflected rays backwards – they meet at point I.
- The image formed at I is a virtual image.

✅ Virtual images cannot be captured on a screen.

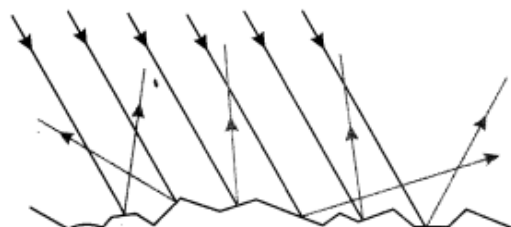
🔄 What is Lateral Inversion?

- In a mirror, the left side appears as right, and right appears as left.
- This swapping is called lateral inversion.

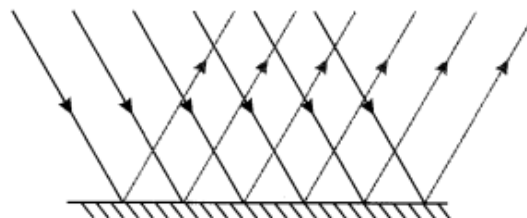
🔥 13.3 Regular and Diffused Reflection

🖋️ Activity 13.4 – How Surfaces Reflect Light

- When parallel rays hit a rough surface, they scatter in different directions.
- This is diffused reflection.



*Rays reflected from
irregular surface*



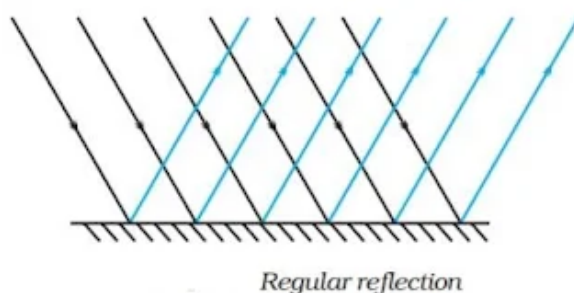
*Rays reflected from
polished surface*

✅ Laws of reflection still apply at every point.

☀️ Key Differences:

Diffused Reflection	Regular Reflection
Happens on rough surfaces.	Happens on smooth surfaces.
Reflected rays scatter.	Reflected rays stay parallel.
No clear image formed.	Clear image formed (like mirror).

Regular reflection:-



✨ 13.4 Reflected Light Can Be Reflected Again

- In a hairdresser's shop, you see the back of your head using two mirrors.
- Light reflects first from the mirror behind you, then from the front mirror, and finally reaches your eyes.
- Reflected light can be reflected again from another mirror.



☀ Fun Fact — Periscope

- A periscope uses two plane mirrors to reflect light twice.
- Used in:
 - Submarines 🚢
 - Tanks 🛡
 - Bunkers 🏠

✅ Helps to see objects that are not directly visible.

✨ 13.5 Multiple Images

- A single plane mirror forms one image.
- Two plane mirrors placed at an angle create multiple images.

🔥 Activity 13.5 – Observing Multiple Images

🔧 Steps:

1. Place two plane mirrors at 90° angle touching each other.
2. Put a coin between them.
3. Observe the number of images.
4. Change angles to 45° , 60° , 120° , 180° and observe images with another object (like a candle).
5. Parallel mirrors (180°) create infinite images!

✅ The closer the mirrors to parallel, the more images are formed.



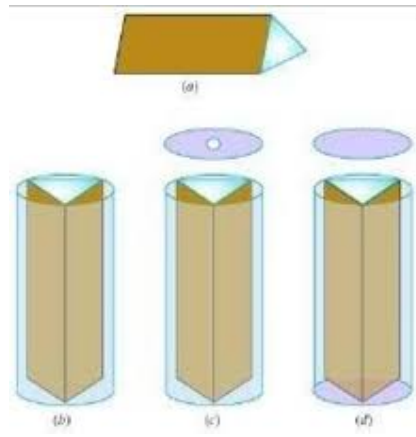
🌀 Kaleidoscope (Extended Concept)

- A kaleidoscope uses three mirrors to create beautiful patterns by multiple reflections.
- Designers use kaleidoscopes for new designs.

🔥 Activity 13.6 – Making a Kaleidoscope (Fig. 13.12)

🔧 Materials:

- Three rectangular mirror strips
- Cardboard tube
- Transparent plastic sheet
- Pieces of colored glass (like broken bangles)



✓ When you look inside, you see changing patterns every time!

☀️ 13.6 Sunlight – White or Coloured?

- Sunlight appears white, but it is actually made of seven colors.

🔥 Activity 13.7 – Dispersion of Light (Fig. 13.13)

🔧 Steps:

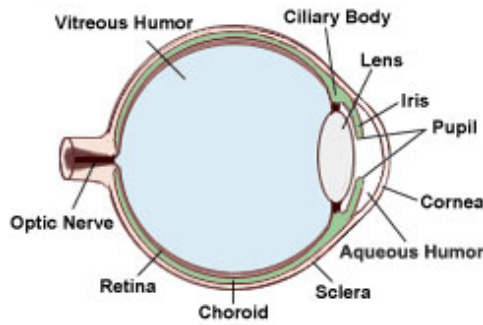
1. Place a mirror in a bowl filled with water.
2. Allow sunlight to fall on the mirror.
3. Observe the spectrum of colors on a wall or white sheet.



✓ The splitting of light into different colors is called dispersion.

✓ Rainbow is a natural example of dispersion!

👁️ 13.7 What is Inside Our Eyes?



- **Cornea:** Transparent front part that lets light enter.
- **Iris:** Colored part of the eye; controls the size of the pupil.
- **Pupil:** Opening that controls the amount of light entering.
- **Lens:** Focuses light onto the retina; convex lens.
- **Retina:** Inner screen of the eye with two types of cells:
 - **Cones:** Sensitive to bright light and colors.
 - **Rods:** Sensitive to dim light.
- **Optic Nerve:** Carries signals to the brain.

✓ Blind Spot:

- A place on the retina with no vision (no nerve cells).

🔥 Activity 13.8 — Observing Pupil Size

- Shine a torch into a friend's eye:
 - In bright light → Pupil contracts (smaller).
 - In dim light → Pupil expands (bigger).

✓ More light = smaller pupil

✓ Less light = larger pupil

🔥 Activity 13.9 — Finding the Blind Spot (Fig. 13.15)

- Draw a dot and a cross on paper.



- Close one eye and move the paper closer.
- At a certain point, the dot or cross disappears — this is the blind spot.

🔥 Activity 13.10 — Seeing a Bird Inside a Cage!

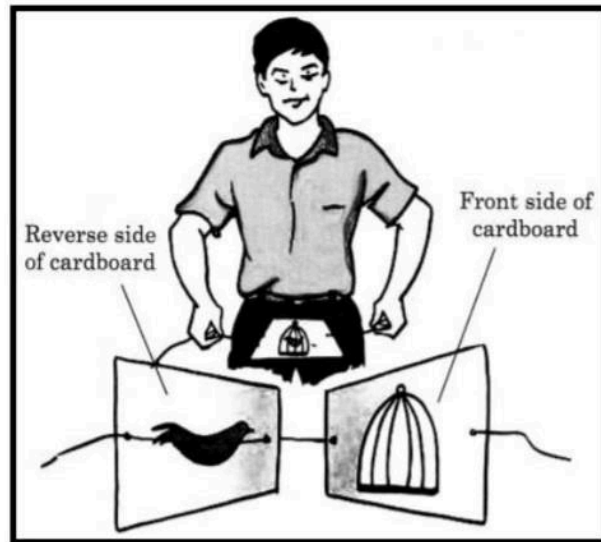
🔧 Materials Needed:

- A square cardboard (6–8 cm size)
- A string or thread
- A drawing of a bird on one side

- A drawing of a cage on the other side

Steps:

1. Make two holes in the cardboard.
2. Thread the string through the holes.
3. Draw a cage on one side and a bird on the other.
4. Twist the string and spin the card rapidly.



Taking Care of Our Eyes

- Have regular eye checkups.
- Use spectacles if needed.
- Avoid reading in dim or too bright light.
- Never rub your eyes if something enters — wash with clean water.
- Avoid looking directly at bright lights or the Sun.
- Eat food rich in Vitamin A:
 - Carrots, spinach, mangoes, papaya, milk, butter, eggs.

 Lack of Vitamin A can cause night blindness.

Fun Facts about Animal Eyes

- Crab: Small eyes but can see in all directions.
- Butterfly: Large eyes made of many small eyes.
- Owls: See well at night (more rods).
- Day birds (kite, eagle): See well during the day (more cones).

13.9 Visually Impaired Persons Can Read and Write

- Some people cannot see or have very low vision.
- They develop sharper other senses like hearing and touch.

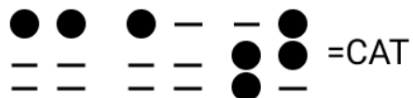
 Tools help them:

- Braille system
- Audio books
- Magnifiers
- Talking computers

abc 13.10 What is the Braille System?


- Invented by Louis Braille (1821).
- Uses patterns of raised dots.
- Each set of dots represents a letter or a word.
- Braille is used in many Indian languages too.

C A T



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and , (comma)



- ✓ Braille helps visually impaired persons read by touch.