Lights and Sound

3. Light

LEARNING OBJECTIVES

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INTRODUCTION

We see the colourful and beautiful world around us. Light helps us to see things around us. We cannot see light but light creates sensation of vision. We detect light with our eyes. Light is a form of energy.

SOURCES OF LI GHT - NATURAL AND ARTIFICIAL

The objects that give out light are called sources of light.

There are two types of source of light

1. Natural sources: Sun and stars are natural sources of light.

2. Man-made (or artificial sources): Electric bulb, glowing tube-light, fire, burning candle etc are all man-made sources of light.

Do You Know

Sometimes luminous objects give off light at different wavelength which is invisible. These materials are called fluorescent materials.

LUMINOUS AND NON-LUMINOUS OBJECTS

The objects which emit their own light are called **luminous objects.** For e.g.

Sun, stars, torch, fire, flame of a candle are luminous objects. We can see luminous objects due to the light emitted by them.

The objects which do not emit their own light are called **non-luminous objects.**

For e.g. Earth, table, chair, flowers etc., are non-luminous objects. Non-luminous objects are visible only if the light falling on them from luminous objects.

TRANSPARENT, TRANSLUCENT AND OPAQUE OBJECTS

An object which allows most of the light pass through it is called a **transparent object.** For e.g. Air, glass, water, etc.

An object which allows only a part of the light to pass through it is called **translucent object.** For e.g., Milky white plastic, frosted glass etc.

An object which does not allow light to pass through it is called opaque object.

For e.g., wood, cement, metal sheet etc.

Do You Know

Ultraviolet rays can go through translucent objects. Due to this a person behind this object can get a sunburn on a Sunny day.

RECTILINEAR PROPAGATION OF LIGHT

Light travel in a straight line. It is known as **rectilinear propagation** of light.

Do You Know

Speed of light is different in different media. Speed of light is maximum in vacuum i.e., $3\times10^{8} m/s$.

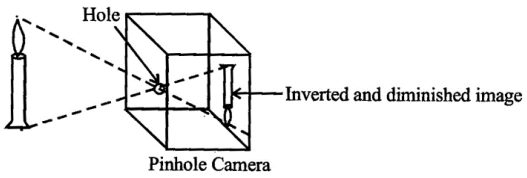
If you see the flame through the holes at same level, the flame is visible but if one of the cardboards is displaced such that holes are not in straight line the flame of the candle will not be visible. This suggests that light travels in a straight line.

PINHOLE CAMERA

A pinhole camera works on principle of rectilinear propagation of light and pin-hole acts as a lens.

Do You Know

Artists from the sixteenth century onwards used a pinhole camera to help them get the correct colour proportions for a painting.



The box is closed from all sides and a forested glass sheet covers one side, containing a very small hole in the centre. An inverted image of the object is formed on it.

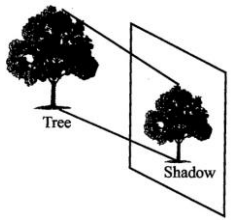
SHADOWS AND IMAGES

Shadows

When light falls on an opaque object, it obstructs the path of light and shadow is formed. Thus shadow is the region of absence of light.

Do You Know

Shadow is longest in the early morning and in the late afternoon.



The main requirements for the formation of a shadow are:

(i) A source of light
(ii) An opaque obstacle
(iii) A screen behind the obstacle.

Important characteristics of a shadow

(1) Shadow is formed when path of light is obstructed through an opaque object.
(2) Shadow lies to the opposite side of the source of light.
(3) The size of a shadow changes according to the position of source of lightw.r.t the object.

Image

When rays of light after reflection meet then image of object is formed. It is an impression of an object.

Comparison of shadow and image:

Do You Know

Image formed by convex mirror is always smaller than object and the image formed by concave mirror may be larger, smaller or equal to the size of the object depends upon the position of the object from the mirror.

	Shadow	Image
1.	Shadow is the region of absence of light due to obstruction in its pat.	Image is the impression of an object formed when rays of light after reflection meet.
2.	Shadow is always dark.	Image has all the colours of the object.
3.	Shadow may be bigger or smaller in size than the actual size of an object.	Image formed by a plane mirror is of the same size as that of the object.

SOLAR AND LUNAR ECLIPSE

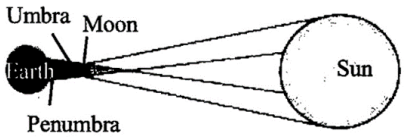
Solar and lunar eclipse are formed due to the shadows only.

Solar eclipse

We know that moon revolves around the earth. When moon comes in between the sun and the earth, then the shadow of moon falls on the earth creating darkness over a small region of earth. This incident is known to be solar eclipse.
Since the size of moon is smaller as compared to the sun, so the region of total darkness (umbra) is small and region of partial darkness (penumbra) is bigger

Do You Know

There are 2 to 5 solar eclipses each year.

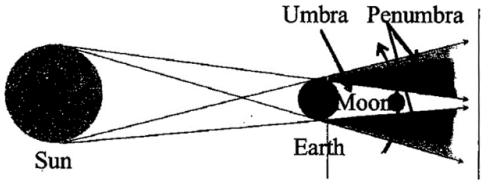


Lunar eclipse

When during the revolution earth comes between the sun and the moon then shadow of earth is formed on the moon, due to which it appears to be dark.
This phenomenon is called lunar eclipse. Since the size of earth is bigger than that of moon, so the region of total darkness (umbra) is more than the region of partial darkness (penumbra).

Do You Know

The Danjon scale is used to describe the darkness of a total lunar eclipse.



REFLECTION OF LIGHT

When a ray of light falls on an opaque object, it bounces back. This bouncing back of light into the same medium is called reflection of light. Non-luminous objects are visible because they reflect light rays falling on them.

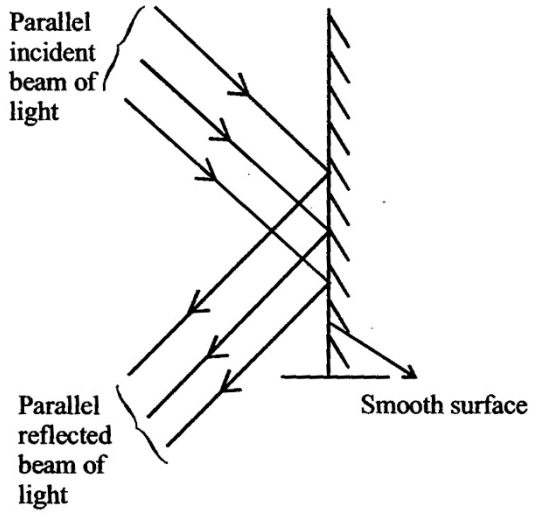
Reflection of light from a smooth and rough surface

Reflection of light from a smooth surface is called **regular reflection.** In regular reflection a

parallel beam of incident light is reflected back as a parallel beam in one direction. Plane mirror and highly polished metal surfaces produce regular reflection. Images are formed by regular reflection.

Do You Know

In early age mirrors are formed by polishing a volcanic rock called obsidian which was glassy and black.



When a parallel beam of light falls on a rough surface then light is reflected in **different direction,** it is known as **diffuse reflection** or **irregular reflection.**

Rough surfaces like wall, table, cardboard, etc. produce diffuse reflection.

Do You Know

We are able to see an object due to diffuse reflection.