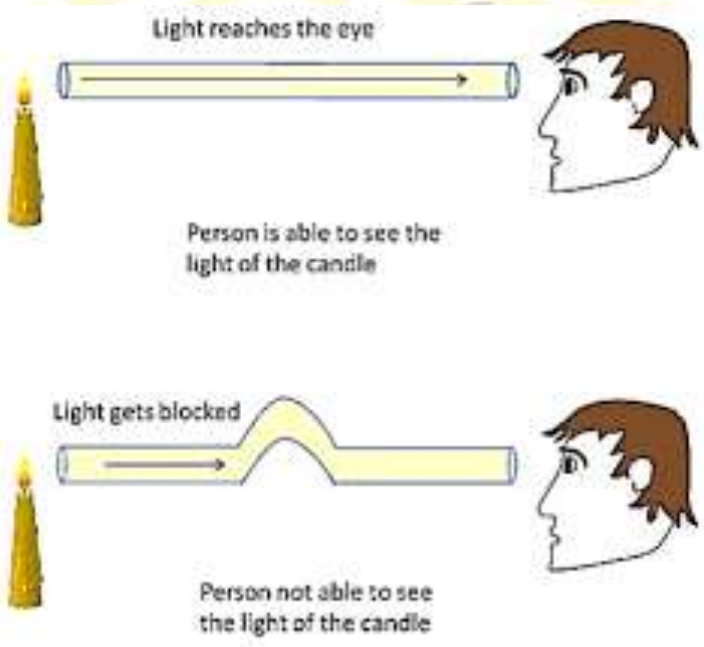
## Introduction

- We see beam of sunlight, beam of headlight, beam of light from torch. Beam of light from LED.
- Because of the light we are able to see things around us.

## Light travels along a straight line

- **Activity 1**
  1. Take a candle and two pipes. One pipe should be straight and the other one should be bent.
  2. Lit the candle.
  3. Now look at the candle through the straight pipe and then again look at the candle through the bent pipe.
  4. You will be able to look at the candle only through the straight line.
  5. Candle will not be seen through the bent pipe.
- This activity proves that light travels in the straight line.
- The light of the candle travels in the straight line that is why It cannot travel through a bent pipe.




## Reflection of light

- There is a way to change the direction of light.
- If a light falls on a shiny surface it changes its direction.
- Any surface which acts like a mirror like a stainless steel, shining steel spoon, or even water can change the path of light when light falls on it.
- When the direction of light is changed by a shining surface is called reflection of light.

- **Activity 2**
  1. Take a torch and a chart paper.
  2. Make three narrow slits in the chart paper and cover the torch with it.
  3. Take a mirror and fix it vertically on a wooden board.
  4. Now direct the torch to the mirror at an angle.
  5. You will notice that mirror changes the direction of the light.
  6. Now look along the direction of reflected light into the mirror. You will be able to see the slits in the mirror.

- From the above activity we conclude that mirror changes the path of light and it is known as the reflection of light.
- One more thing that we conclude that when the reflect light from an object reaches to our eyes then only the object is visible to us.
- For example, when we look along the direction of the reflected light then only, we were able to see the slits.
- When we place an object in front of a mirror then what appears behind the mirror is called the image of that object.
- When the image is exactly same like the object then the image is called erect.

- For example: if we place a lighted candle in front of a plane mirror then the image will exactly same with the flame appear on top of the candle. Such image is erect.
- The plane mirror form images that are erect and of same size as the object.
- In plane mirror, the distance between the image and the mirror is exactly same as the distance between mirror and objects.
- The image cannot be obtained on a screen formed by the mirror.

## Right or left

- When we look at our image in the mirror an interesting difference, we can observe that our right appears to be left and our left appears to be right but not upside down.
- For example: if you touch your right ear your image will touch left ear.
- The image of your name written in a paper will look different in mirror.
- This is the reason why ambulance is written in such a strange manner so that anyone can easily read it right in the side mirror.

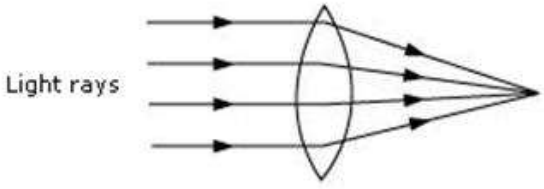
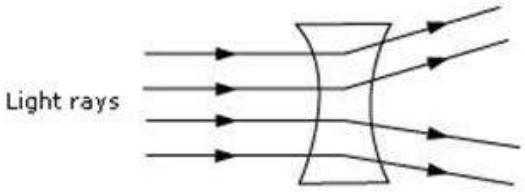
## Playing with spherical mirror

- Spherical mirror is the example of curved mirror. It can have two reflecting surfaces one is convex mirror and another is concave.
- The spherical mirror is a portion of a sphere. If the inner part is reflecting then it is known as concave mirror. If the outer part is reflecting then it is known as convex mirror.

- Spoon is the perfect example of a spherical mirror. The inner surface of a spoon is a concave mirror and the outer surface is the convex mirror.
- If you look at the outer surface of the spoon which acts like a convex mirror the image formed of an object on the mirror will always be erect and image will be smaller than the size of the object.
- If you look at the inner surface of the spoon which acts like concave mirror the image of an object will be inverted that is upside down. But if you bring your object closer to the mirror the image will be erect.
- So, from a specific distance of the object from the mirror the image will be inverted and larger in size as compare to the object but, from a close distance the image will be erect.
- An image that can be obtained on a screen is called the real image but the image that cannot obtained on a screen is called virtual image
  For example: the reflected image of a candle from the plane mirror can not be obtained on the screen such image is called virtual image. The reflected image of the sun from a concave mirror can be obtain on a screen such image is real image.
- The image formed by a concave mirror can either be real or virtual and in larger or smaller size as compared to the object depending upon the distance of the object from the mirror.
  - **Activity3**
    1. Take a lighted candle, a concave mirror and a screen. You can make the screen by a chart paper on a cardboard.
    2. Place the candle between the mirror and the screen at some distance say about 50cm from the mirror.
    3. The image will be larger, sharp, inverted and real.
    4. Now bring the candle slightly close to the mirror the image will still be real and inverted but this time more enlarged.
    5. Now bring the candle very close to the mirror
    6. The image will be now erect, very magnified and virtual. That means you cannot obtain the image of the candle on the screen.
- Concave mirrors are used as the reflectors of torches and headlights of the automobiles.
- As concave mirror produces enlarged images it is used by doctors for the treatments of eyes, ears, nose, throat and teeth.
- Images formed by convex mirror produces virtual and erect images. The images are smaller in size irrespective of the distance of the object from the mirror.
- The convex lens is used as the side mirrors so that they see the large area of traffic behind them.

## Images formed by lenses

- Lenses are transparent that are used in various devices like telescope, microscope, binoculars, magnifying glasses, spectacles etc.
- There are two main type of lenses a) convex lens b) concave lens
- Convex lenses are thicker in the middle as compared to the edges.
- Concave lenses are thicker at the edges than the middle.
- A convex lens is a converging lens which converges the light rays
- A concave lens is a diverging lens which diverges the light rays.
- One should be careful while playing with magnifying glass as it has convex lens. You should not focus sunlight with a convex lens on any of your body part as it can burn the part of your body where the focused light get fall.
- The properties of images formed by the convex lens is as same as the images formed by concave mirrors that is it produces real and inverted images and when we bring the object closer to the convex lens the image obtained is virtual and larger in size.
- Similarly, the properties of images formed by a concave lens is same as the images obtained by convex mirrors that is it produces virtual, erect and smaller in size.

| Convex lens | Concave lens |
|---|---|
| 1. Convex lens is spindle shaped as it is thicker in the middle than at the edges.<br>  <br>Convex lens | 1. Concave lens is thinner in the middle than at the edges.<br>  <br>Concave lens |
| 2. It converges light rays falling on it.<br>  <br>Convex lens | 2. It diverges light rays falling on it.<br>  <br>Concave lens |

## Sunlight- white or colored?

- We have often seen rainbows when notice it carefully we can see that there are seven colors in the rainbow and they are red, orange, yellow, green, blue, indigo and violet.
- We also noticed many in the soap bubbles, and a compact disc is also seen colorful when light is reflected from its surface.

➢ **Activity 4**

1. Take a prism and place it on a table.
2. Place a screen in front of the mirror.
3. Let a narrow beam of sunlight pass through the prism.
4. You will notice that the sunlight that was seem to be white in color gets split into seven colors.

- The white light is composed of seven colors.