Class 7 Physics Light

Introduction

Light

Light is a form of energy which is responsible for the sense of sight.It enables to see things around us.

- Natural sources of light are Sun, fire etc.
- Man-made sources of light are tube lights, bulbs etc.

Light From Different Sources

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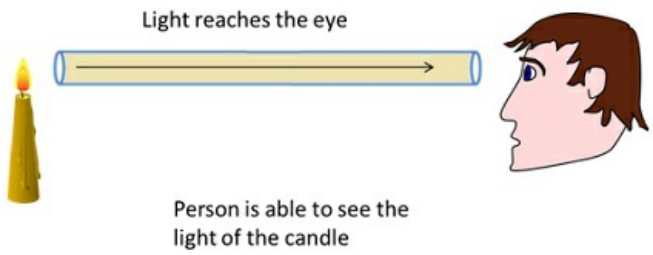
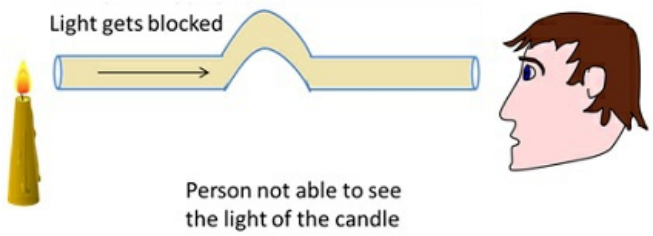
Light travels in a straight line

Light travels in a straight line

Light is made up of packets of energy called photons which travel in a straight line at a very fast speed. Light can move through small apertures and holes and can change direction, but will always travel in straight lines.





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Reflection

Reflection

Light, sound, water, electromagnetic waves may change their direction upon striking a surface. This is called **reflection**.

- Light waves get reflected while other waves may penetrate the surface.
- Light gets reflected easily by shiny surfaces like stainless steel plate, water, mirror etc.
- Polished and shiny surfaces act as a mirror due to light reflection capabilities.

Reflection of objects from shiny surfaces like stainless steel and water

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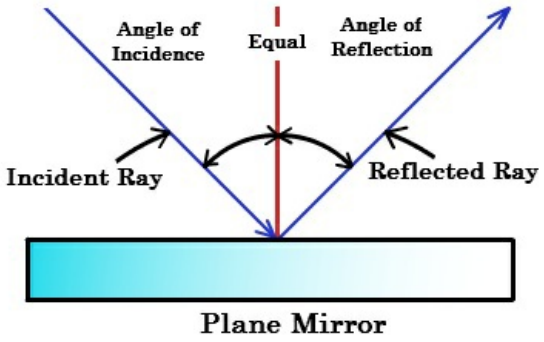
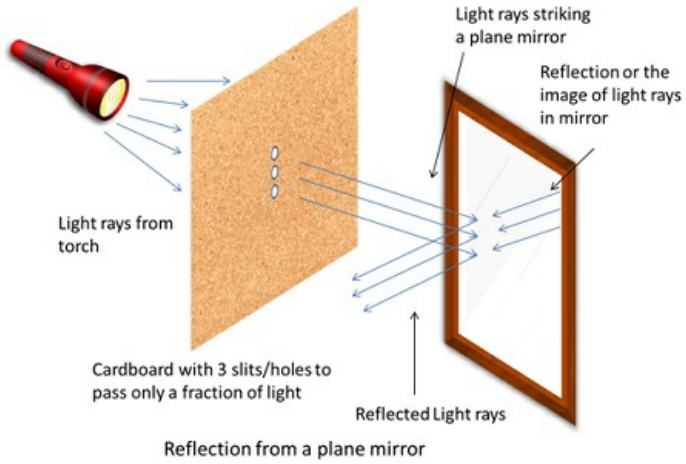
Reflection by Plane Mirror

Reflection by Plane Mirror

- Light falling on a plane mirror at an angle (Angle of incidence) gets reflected at the same angle (Angle of reflection) in other direction.



- When an object is placed in front of the mirror, an image of the object is formed by the mirror which appears to be behind the mirror.
- The image formed by a plane mirror is
  - Erect (upright position)
  - Of the same size as the object
  - At the same distance as the object
  - With right and left sides interchanged.
- The image formed cannot be obtained on a screen. If we place a screen (cardboard) in front or back of the mirror, the image will still can be seen only in the mirror and not the screen.



Reflection from a plane mirror

Candle image in mirror is erect, of same size and at same distance

Ambulance is written in reverse, so that a person driving in front can see straight spelling in the rear view mirror and give way.

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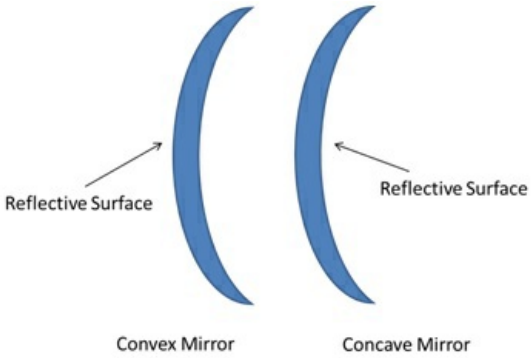
Spherical Mirror

Spherical Mirror

A curved shining surface of an object acts as a mirror.

- Most common types of curved mirrors are called**spherical mirrors**.
- Spherical mirrors are classified based on their reflective surface as one of two types**concave and convex**.
- When a part of sphere is cut, the inside part is called the concave side, while the outside part is called the convex side.
- A common example is a stainless steel spoon whose inside part behaves as a concave and outer part behaves as a convex mirror.



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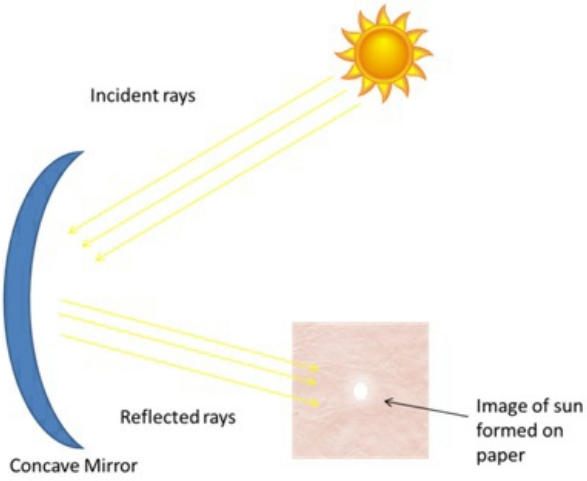
Real and Virtual Image

Real and Virtual Image

When an image is formed on a screen with the help of a mirror, it is called a **Real Image**. Similarly, an image which can't be obtained on a screen with the help of a mirror, it is called **Virtual Image**.

- Concave and convex mirrors can be used to produce real as well as virtual images.



Real Image of sun formed on paper after reflection from a concave mirror.

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Concave Mirror

Concave Mirror

- A concave mirror produces a smaller, bigger and inverted image based on its distance from the object.
- When the distance between object and mirror is large, a small inverted virtual image is formed.
- As the object is brought closer, the image becomes larger.
- At a very close distance, the image is large and upright.

Inverted image formed through reflection of candle light on paper by a concave mirror. This image grows in size as candle is brought closer to the mirror.

Applications of concave mirrors

The application of concave mirrors lies in the fact that when it is **brought closer to an object**, an **enlarged virtual image** is obtained.

- Doctors use it for examining ears, nose, throat and eyes.
- Dentists use it for examining teeth and gums.

Also, a concave mirror **concentrates the light** falling on it into a narrow beam. This is used in:

- Torches
- Car headlights

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Convex Mirror

Convex Mirror

- A convex mirror generally produces anerect and smaller image of the object.
- Convex mirror produce virtual images of the objects spread over large area.
- Convex mirrors cannot produce real images.

Applications of convex mirrors

- Rear view mirrors of vehicles so that person driving is able to see most traffic behind him/her.
- As reflectors in street lamps to diverge light over a larger area.
- Used for making sun glasses and telescopes.

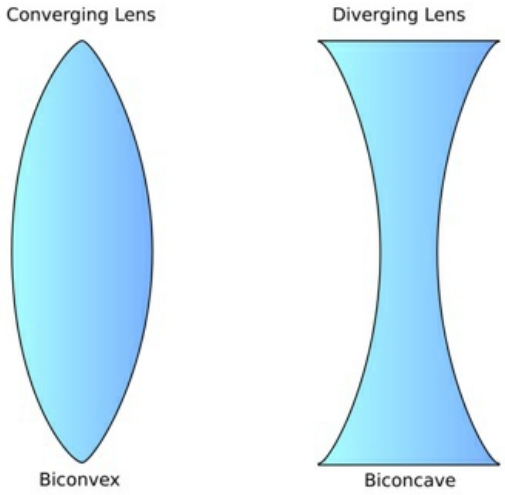
Applications of Convex Mirrors

Class 7 Physics Light Lens

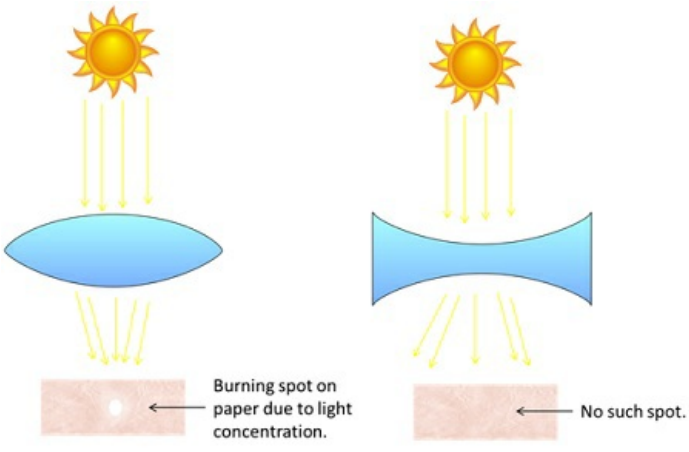
Lens

A Lens is a type of mirror which refracts the light instead of reflection**Refraction** is the bending of a light when it enters a medium. Here the medium is Lens.

- Lens are of various types but the two most important types are**convex (on Bi-convex)** and **concave (or Bi-concave) lens**

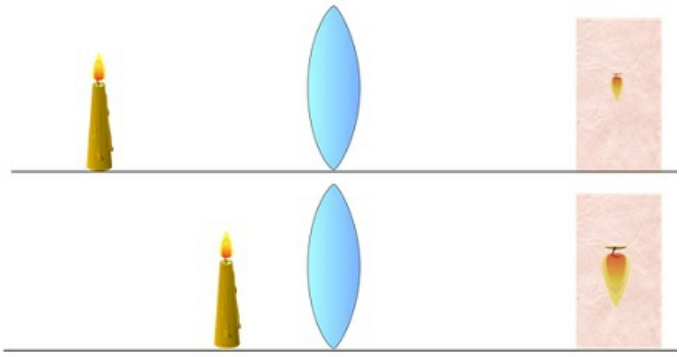


- Convex lens are thicker in middle than the edges whereas concave lens are thinner at the middle than at the edges
- Lenses are transparent and light can pass through them.
- **Convex** lens are also called**convergent** as they concentrate (**bend inward**) the light falling on it.
- **Concave** lens are also called**divergent** lens as they expand the light (**bend outward**) falling on it.



Light refraction through Convex and Concave Lens

- Real images are formed using convex lens by placing them in between the object and the screen.



Inverted image formed through refraction of candle light on paper by a convex lens. This image grows in size as candle is brought closer to the lens.

- Virtual images are also formed by convex lens which is erect and larger in size.
- Concave lens do not form real images. They only form virtual images which are always erect and smaller in size.
- Applications of lens include magnifying glass, telescopes, contact lens, cameras etc.

Applications of concave and convex lens

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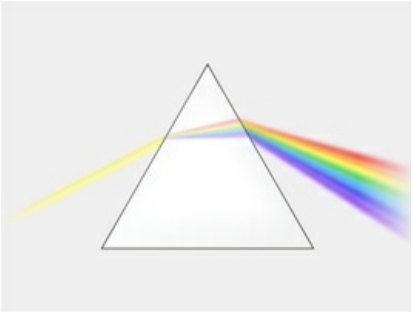
Sunlight

Sunlight

The light rays emitted from the sun appear white but consists of 7 colours namely, red, orange, yellow, green, blue, indigo and violet. There are various phenomena and objects that can split these white rays into individual colour rays.

- Rainbow appears after or during rainfall due to the reflection, refraction and dispersion of suns light by the water droplets in the atmosphere.

- A Prism is a transparent optical object with polished surfaces which refracts light. It refracts the sunlight into the seven colours.



- A compact disc also displays fine lines of these 7 colours when sunlight falls on its shiny side.