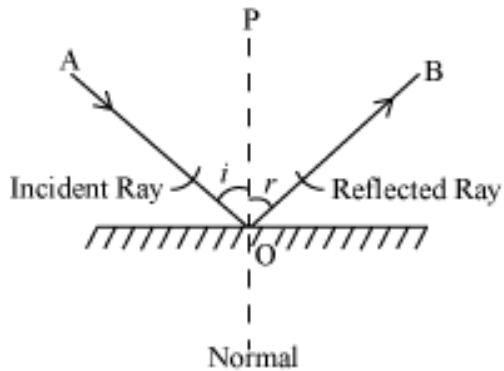


Reflection of light

- Reflection of light makes things visible.



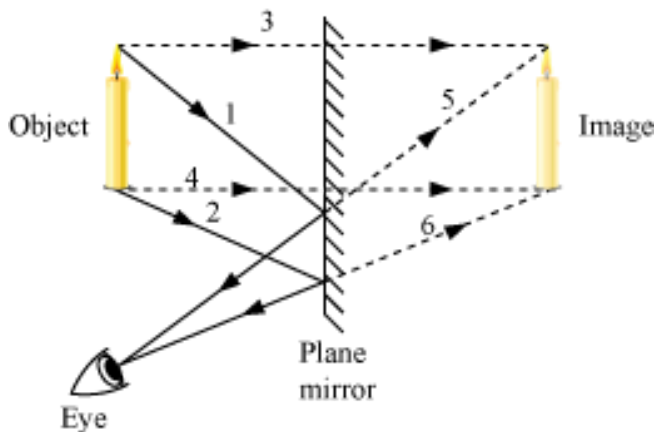
(a) i (Angle of incidence) = r (Angle of reflection)

(b) AO, OP, and OB lie on the same plane.

- **Laws of reflection:**

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

- **Image formation by a plane mirror**



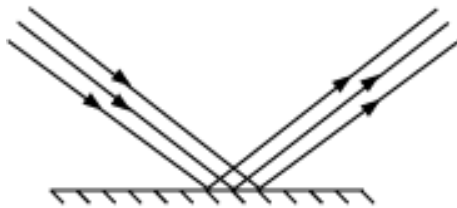
Left part of the candle appears on the right and its right part appears on the left. This is known as **lateral inversion**.

- **Characteristics of images formed by plane mirror**

- virtual and erect
- same size as of object

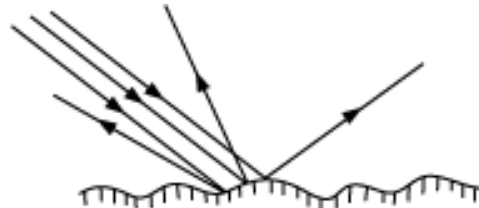
- laterally inverted
- image distance and object distance are same and perpendicular from mirror
- Virtual images are those images which cannot be obtained on screen. But there are some images which can be obtained on screen. Such images are called real image.
- **Uses of plane mirror**
 - It is used as a looking glass.
 - It is used to increase the effective length of an optician's room.
 - In periscope, two parallel plane mirrors are inclined at 45 degrees with vertical walls such that they are facing each other.
 - In kaleidoscope, three plane mirrors are inclined with each other at 60 degrees.
 - It is used in solar heaters and cookers to heat substances by reflecting the sunlight towards the substances.

◦ **Regular reflection**



Regular reflection

Irregular and diffused reflection



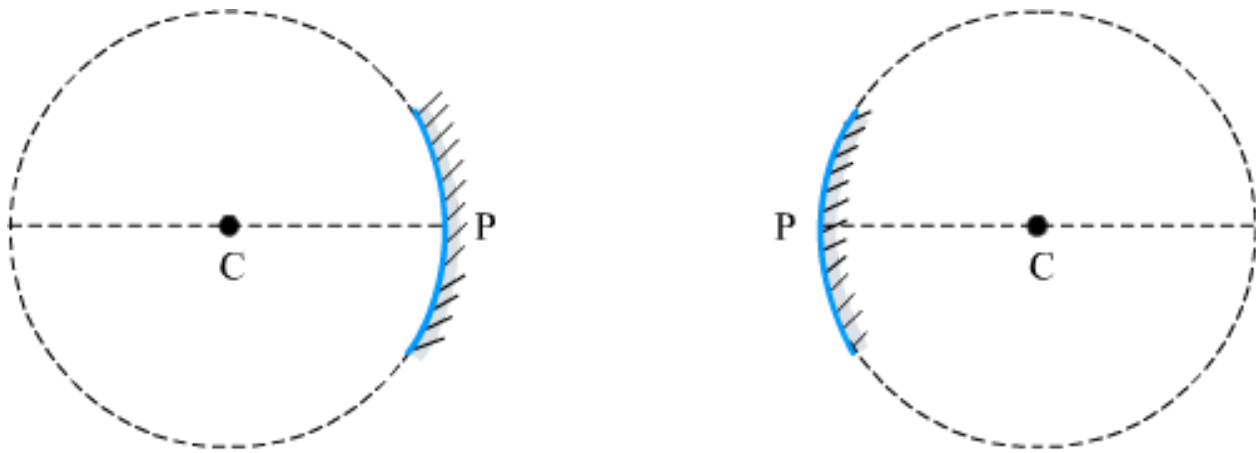
Diffused reflection

- The laws of reflection are valid in regular as well as irregular or diffused reflections.
- Smooth or polished surfaces gives regular reflection.
- Uneven or unpolished surfaces gives irregular reflection.
- Objects that give their own light are known as **luminous objects**
- Objects that are visible because of reflected light are known as **illuminated objects**.
- Kaleidoscope works on the principle of **multiple reflections**.
- **Periscope** is an optical device used to see objects that are not along the line of sight.
- Sunlight consists of several colours.
- Splitting of white light into different colours is called dispersion.

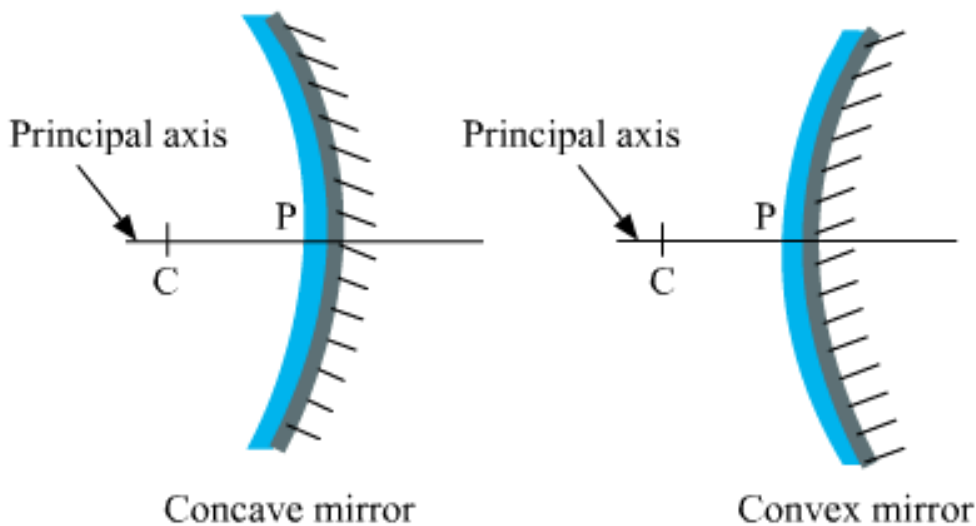
- Number of image formed in multiple reflection =
$$\frac{360^\circ}{\text{angle between two plane mirrors}} - 1$$

Spherical Mirror

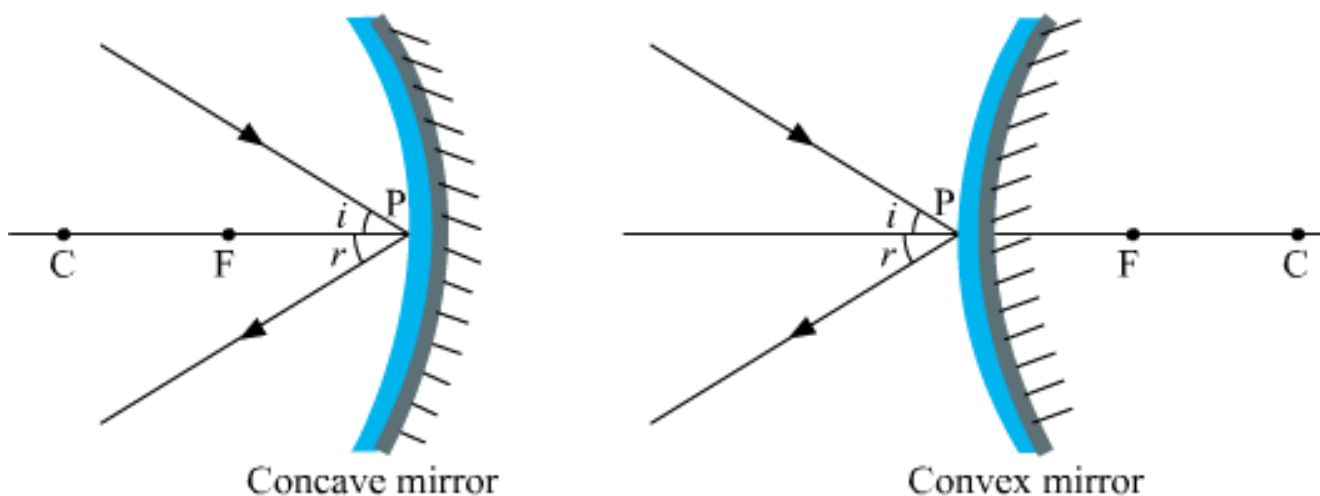
- Centre of curvature: Centre of the sphere of which the spherical mirror is a part



- Pole: It is the midpoint of the aperture of the spherical mirror or mirror centre.



- Focus: Where parallel rays (parallel to the principal axis) meet or appear to meet after reflection.
- Principal Axis: The imaginary line that runs through the pole and the center of curvature of a spherical mirror.
- Distance of focus from the pole is half the radius of curvature.



Spherical Mirror

- Concave spherical mirror – A spherical mirror whose reflecting surface is towards the centre of the sphere is called concave spherical mirror.
- Convex spherical mirror – A spherical mirror whose reflecting surface is away from the centre of the sphere is called convex spherical mirror.
- Focal length – The distance between the pole and the principal focus of the mirror is called the focal length (f) of the mirror.
- For both the spherical mirrors the $f = R/2$
- Mirror formula for both the mirrors is
- $1/f = 1/u + 1/v = 2/R$
- For convex mirror:

Position of object	Position of object
At infinity	At the Focus behind the mirror
Between infinity and the pole	Between the pole and the focus behind the mirror

- For concave mirror:

Position of object	Position of object
At infinity	C
Beyond C	Between F and C
At C	At C
Between C and F	Beyond C
Beyond C	At infinity
Between P and F	Behind the mirror

- Difference between a real image and a virtual image

S. No.	Real Image	Virtual Image
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1.	Can be obtained on a screen or wall	Cannot be obtained on a screen or wall
2.	Can be touched	Cannot be touched
3.	Formed in front of the mirror	Formed behind the mirror
4.	Formed by concave mirrors only	Formed by all types of mirrors i.e., plane, convex, and concave
5.	These images are always inverted	These images are always erect

1. Concave mirror is used as the reflector of a torch, dentist mirror, etc. It is also used in solar furnaces.

2. Convex mirror is used as a rear view mirror in vehicles. It also used road safety mirrors.