PHYSICS

CHAPTER -4 REFLECTION OF LIGHT

Light

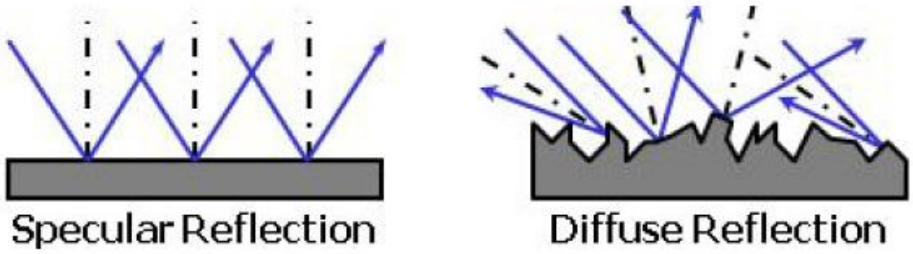
An object reflects light that falls on it. This reflected light when received by our eyes, enables us to see things.

Reflection of Light

- **It is the phenomenon of bouncing back of light in the same medium on striking the surface of any object**
- **There are two types of reflection**
    1. **Regular / specular reflection**
    2. **Irregular / diffuse reflection**

Regular Reflection: When the reflecting surface is smooth and well polished, the parallel rays falling on it are reflected parallel to one another, the reflected light goes in one particular direction. This is Regular reflection or Specular reflection see below figure.

Irregular reflection: When the reflecting surface is rough, the parallel rays falling on it reflected in different direction, as shown in below fig. Such a reflection is known as diffuse reflection or irregular reflection.



Law of Reflection

When light is reflected from a smooth surface, the angle of incidence and angle of reflection are equal. The incident ray, reflected ray and normal to the surface are in the same plane.

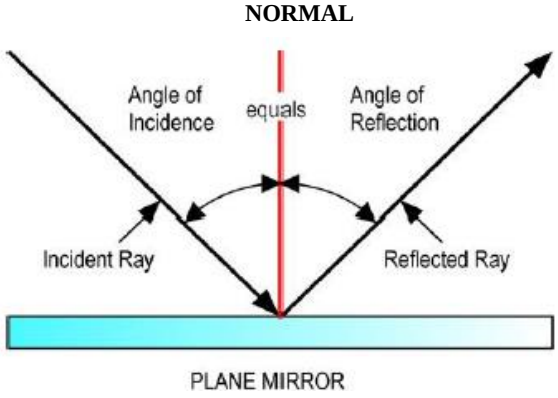


Image formation by a Plane Mirror

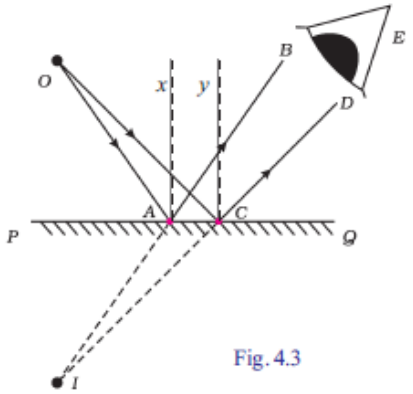
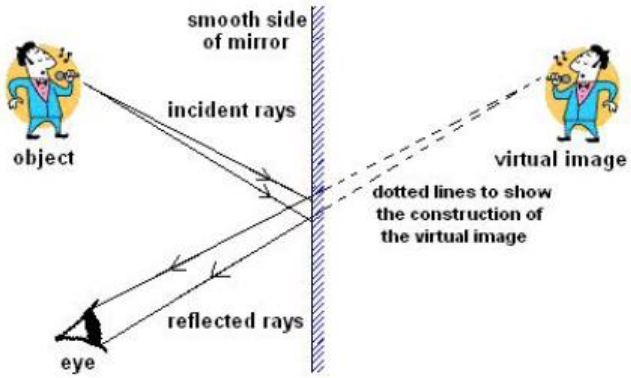


Fig. 4.3



Characteristics of image formation by a plane mirror

1. The image of real object is always virtual. Such image cannot be taken on a screen.
2. The image formed in a plane mirror is always erect.
3. The size of the image in a plane mirror is always the same as the size of the object.
4. The image formed in a plane mirror is as far behind the mirror, as the object is in front of the mirror.
5. The image formed in a plane mirror is laterally inverted i.e. the left side of the objects becomes the right side of the image and vice-versa.

Multiple Reflection and Image Formation

Angle (θ)	Number of images (*n*)
45	7 images
60	5 images
90	3 images
120	2 images
180	1 image

Table 4.1

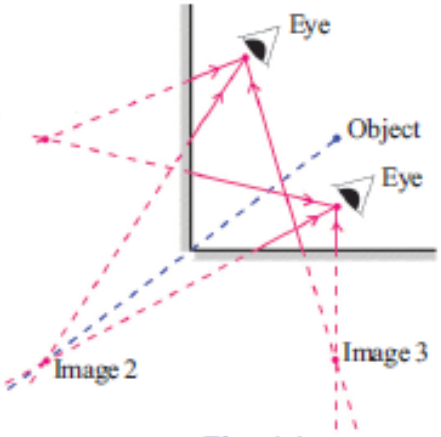


Fig. 4.4

When an object is placed in between two mirrors at an angle of θ the number of images (n) formed is given by

$$\text{Number of images } n = \frac{360}{\theta} - 1$$

e.g if angle between the mirror is 90^0, number of images n = $\frac{360}{90} - 1$ = 4-1 = 3 (as shown in the figure)

NOTE: if n is any fraction then round the number into next digit

example if angle between the mirror is 50^0 then

n = $\frac{360}{50} - 1$ = 7.2-1 = 6.2 so the total number of images formed is taken as 7 not as 6

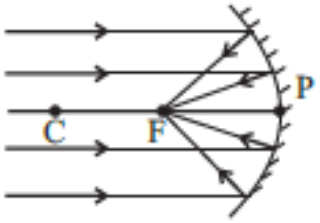
Field of View of Mirrors

The field of view of a mirror is the maximum range of the vision through the mirror

Note: convex mirror has maximum field of view, concave mirror has the least field of view that is why convex mirror is used as a rear-view mirror in vehicles.

IMAGE FORMATION BY A SPHERICAL MIRROR

1. Object
At infinity

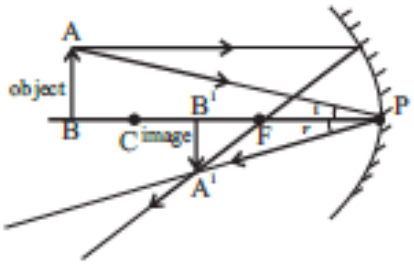


Position of Image
At focus

Size of Image
Highly diminished (point size)

Nature
Real and Inverted

2. Object
Beyond C

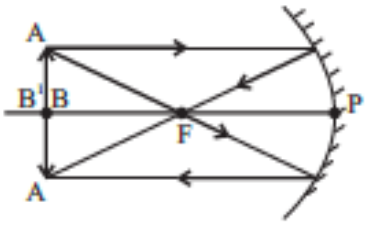


Position of Image
Between F&C

Size of Image
Small

Nature
Real and Inverted

3. Object
At C

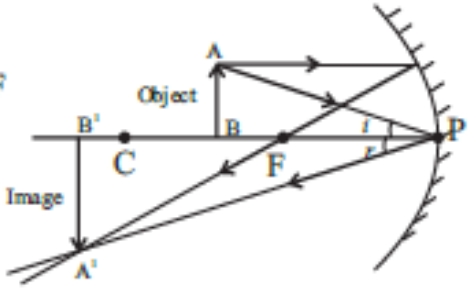


Position of Image
At C

Size of Image
Same Size of object

Nature
Real and Inverted

4. Object
Between C&F



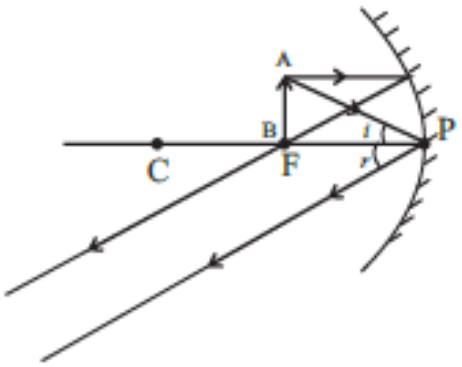
$i = r$

Position of Image
Beyond C

Size of Image
Enlarged

Nature
Real and Inverted

5. Object
At F



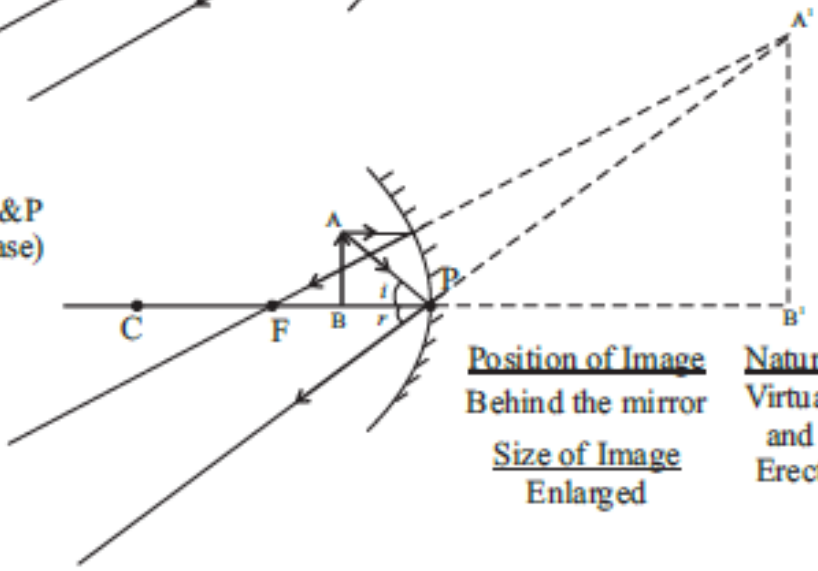
$i = r$

Position of Image
At (infinity)

Nature
Real and Inverted

Size of Image
Highly enlarged

6. Object
Between F&P
(Special Case)



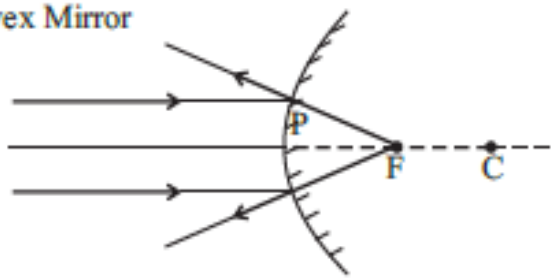
Position of Image
Behind the mirror

Nature
Virtual and Erect

Size of Image
Enlarged

Image formation by Convex Mirror

1. Object
At infinity

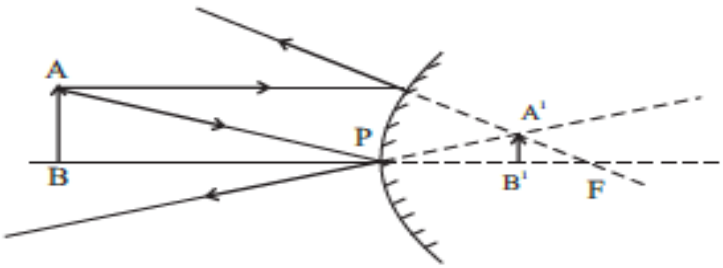


Position of Image
At focus

Size of Image
Highly diminished

Nature
Virtual & erect

1. Object
Anywhere between infinity and pole of the mirror



Position of Image
Between P & F

Size of Image
Very small

Nature
Virtual & erect