Ratna Sagar

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Education, Our Mission

ICSE
Living Science
Physics

Class 10

Chapter 9 Reflection of Light

As per the latest ICSE syllabus

9

Revised and Updated

Living Science PHYSICS

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EDUCATION, OUR MISSION

LEARNING OBJECTIVES

Light and its Nature

Reflection of Light

- **Reflection of light from a plane mirror**
- **Laws of reflection**

Types of Images

- **Images formed by a pair of mirrors**
- **Uses of plane mirrors**

What is light?

Light causes the sensation of sight. Light is a form of energy. It consists of electromagnetic waves which do not require a material medium for their propagation. The speed of light waves depends on the nature of the medium through which they pass. The speed of light waves in vacuum is very high, being 3×10^8 m/s.

Reflection of Light

When light falls on the surface of an object, then three things can happen depending on the nature of the object on which it falls. For example,

1. An ordinary glass sheet allows all the light falling on it to pass through it. So, light is **transmitted** by a transparent glass sheet.

2. If light falls on a black object (or surface), then most of the light is **absorbed**. So, light is absorbed by a black object (or surface).

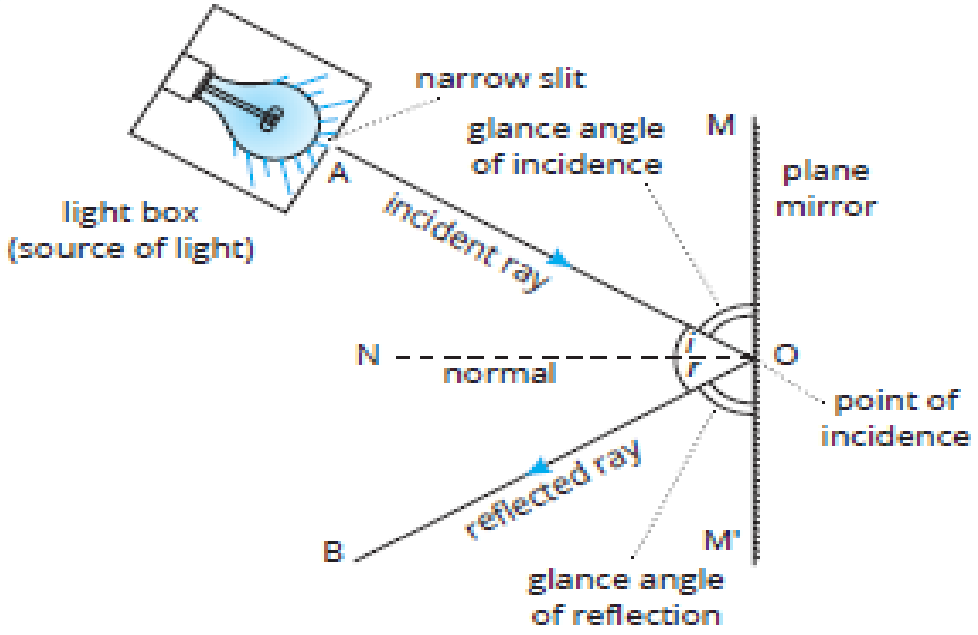
3. If light falls on a shining mirror, then it is neither transmitted nor absorbed, it is sent back. The sending back of light by a mirror is called **reflection** of light. So reflection is the phenomenon in which light rays on striking a surface are sent back into the same medium.

Reflection of light from a plane mirror

A plane mirror is a thin, flat and smooth sheet of glass having a shiny coating of silver metal on one side.

Some important terms related to the reflection of light.

1. Incident ray: The ray of light which falls on the mirror's reflecting surface is called the incident ray.



2. Point of incidence: The point at which the incident ray strikes the reflecting surface of the mirror is called the point of incidence.

3. Reflected ray: The ray of light which is sent back by the mirror is called the reflected ray. The reflected ray travels in the same medium in which the incident ray is travelling.

4. Normal: The 'normal' is a line drawn at right angle (perpendicular) to the mirror surface at the point of incidence.

5. Angle of incidence: The angle which the incident ray makes with the normal at the point of incidence is called the angle of incidence.

6. Angle of reflection: The angle which the reflected ray makes with the normal at the point of incidence is called the angle of reflection.

7. Glance angle of incidence: The angle which the incident ray makes with the mirror is called the glance angle of incidence.

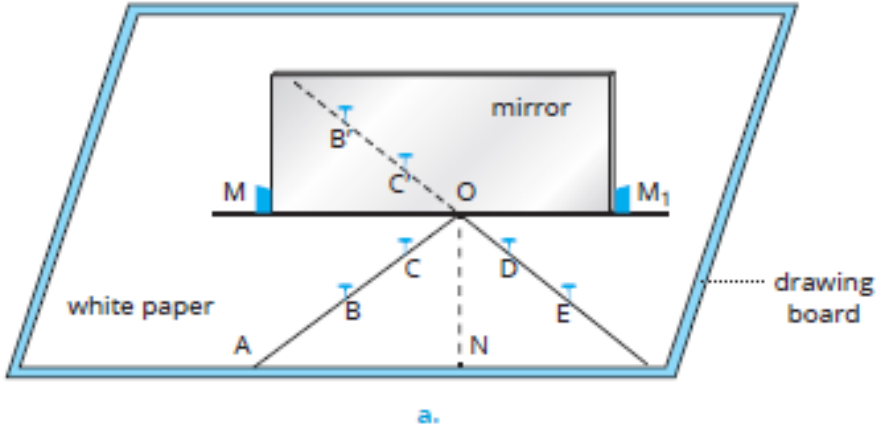
8. Glance angle of reflection: The angle which the reflected ray makes with the mirror is called the glance angle of reflection.

Laws of Reflection

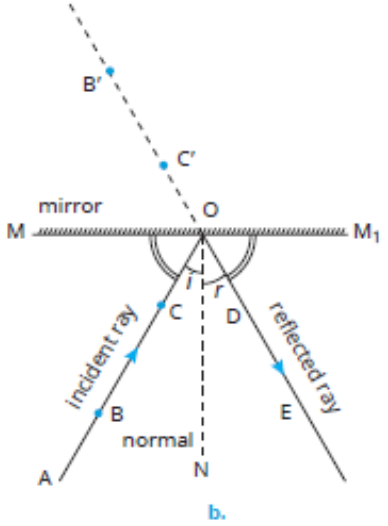
The laws of reflection of light are as follows:

1. When a ray of light falls on a reflecting surface, it is reflected in such a way that the angle of incidence is equal to the angle of reflection.

2. The incident ray, the normal and the reflected ray all lie in the same plane.



a.



b.

Types of Images

1. Real Image: The image which can be obtained on a screen is called a real image. The images formed on a cinema screen is an example of a real image.

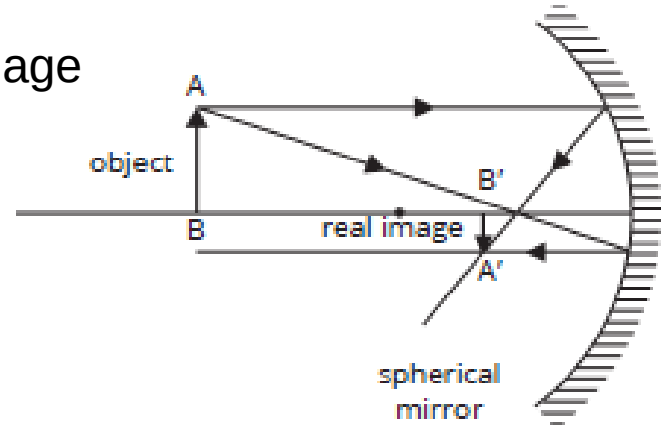
a. Real image

b. Virtual image

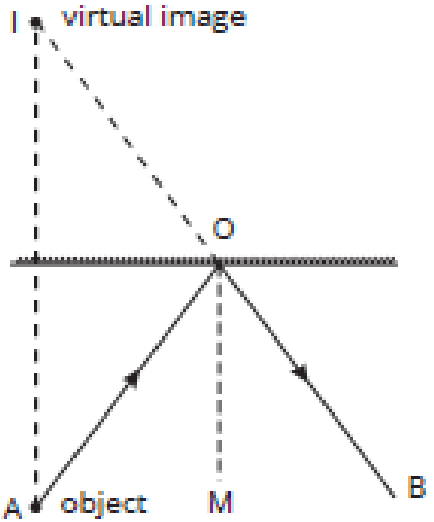
2. Virtual Image: The image which cannot be obtained on a screen is called a virtual image. We see the image of our face in a plane mirror. This is an example of a virtual image.

Diagram showing real and virtual image

Real image



Virtual image



Note: Refer to Table 9.1 for Differences between real and virtual image

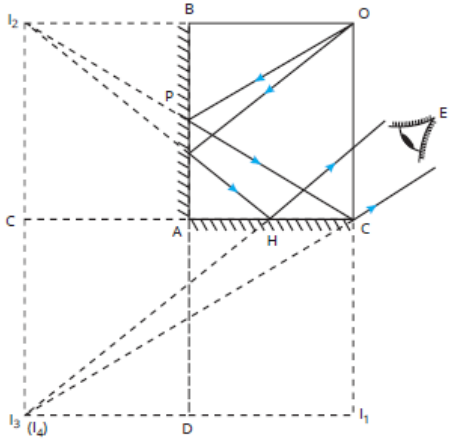
Images formed by a pair of mirrors

If an object is placed between the two mirrors, we get many images of the object. This is because the image formed by one mirror acts as an object for the second mirror. Further, image of images are also formed. This continues till no more reflection by any mirror is possible. This phenomenon is referred to as **multiple reflections**.

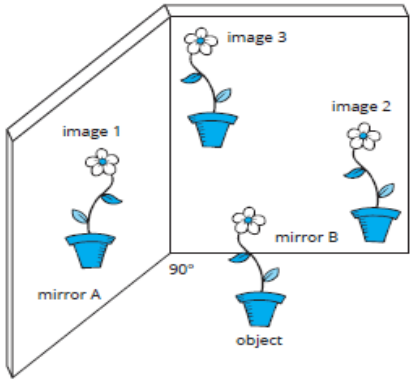
Formula for number of images formed by a pair of plane mirrors

The actual number of images (n) formed depends upon the angle (Q) between the mirrors and can be mathematically determined by the following formula:
Number of images, $n = (360^\circ / Q) - 1$ [1 is subtracted because of the loss of one image due to overlapping of two images.]

Images formed by a pair of mirrors placed perpendicular to each other



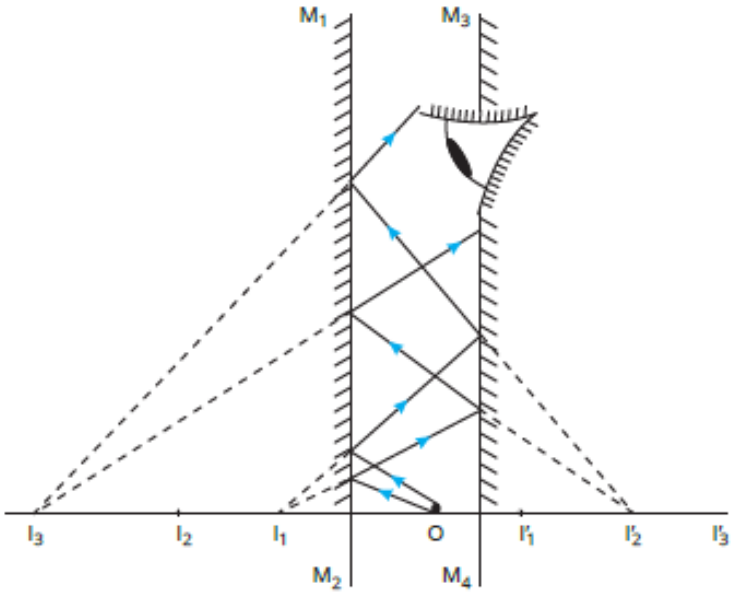
a. Images formed by two perpendicular mirrors



b. If two mirrors are kept perpendicular to each other, three images are formed for an object kept in between them

Three images are formed for an object kept in between two mirrors placed perpendicular to each other.

Images formed by a pair of mirrors placed parallel to each other



Uses of plane mirrors

1. as looking glasses.
2. in providing false dimensions in showrooms. The effective length of the room appears to be increased by keeping the two mirrors facing each other when fixed on the opposite walls of the room. It is used by opticians, in jewellery shops, etc.
3. in the barber's shop to show the customer the back of his head (for seeing his hair).
4. for the construction of periscopes, kaleidoscopes, solar cookers, etc.
5. for signalling purposes in airports, etc.

SUMMARY...

1. Light: It is a form of energy which causes the sensation of sight.

2. Speed of light: It is 3 × 108 m/s in air (and also in vacuum).

3. Reflection of light: It is the phenomenon in which light rays on striking a surface are sent back into the same medium.

4. Laws of reflection: According to the laws of reflection:

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

5. Number of images formed in a pair of mirrors placed:

- perpendicular to each other: three images formed
- parallel to each other: many images formed (infinite)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