Chapter- 16 Light

Laws of Reflection

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Dispersion of light

Structure of Eye



Laws of Reflection

What makes Things Visible

When beam of light strikes on the surface of medium and after striking it goes in same medium is called reflection.

The objects which shine in the light of other objects are called **illuminated** objects e.g. moon receives light from the sun and reflects it. That's how we see the moon. The objects which emit their own light are known as **luminous** objects. E.g. sun, fire, flame of a candle and an electric lamp.

Laws of Reflection

The angle between the normal and incident ray is called **angle of incidence** (\angle i). The angle between the normal and reflected ray is known as the **angle of reflection** (\angle *r*) shown in figure.

There are the laws of reflection

The angle of incidence is always equal to the angle of reflection i.e. $\angle i = \angle r$. The incidence ray, the normal at the point of incidence and the reflected ray all lie in the same plane.

The image formed by a plane mirror is



virtual, exert and lateral inversion it is defined as, in an image formed by a mirror the left of the object appears on the right and the right appears on the left.



Regular and Diffused Reflection

Image formation by plane mirror

Irregular surfaces

When all the parallel rays reflected from a plane surface are not parallel, the reflection is known as **diffused or irregular reflection**. It is due to the irregularities in the reflecting surface as shown.

Regular reflection

The reflection from smooth surface like that of a mirror is called **regular reflection** as shown in figure. Images are formed by regular reflection.

Multiple Reflected Rays

Regular surfaces

The light reflected from one reflecting surface, if falls on another reflecting surface will get reflected again and this process can continue any number of times, according to the number of reflecting surfaces used and their orientation. Periscopes are used in submarines, tanks and also by soldiers in bunkers to see things outside.





Multiple Images

A number of images formed by mirrors placed at an angle to one another. This is used in a kaleidoscope to make numerous beautiful patterns.

Kaleidoscope

A kaleidoscope is a tube of mirrors containing loose coloured beads, pebbles or other small coloured objects. The viewer looks in one end and light enters the other end, reflecting off the mirrors. Typically there are two rectangular lengthwise mirrors. Setting of the mirrors at 45° creates eight duplicate images of the objects, six at 60°, and four at 90°. As the tube is rotated, the tumbling of the coloured objects presents the viewer with varying colours and patterns. A kaleidoscopic point is a point of intersection of two or more lines of reflection symmetry.



Dispersion of light

Sunlight consists of several colours. White light is actually a mixture of all these colours, it can be separated by using a prism (similar process happens during the formation of rainbow, where water droplets act as prism). The process of scattering of sunlight is called dispersion.



Activity

Take a bowl filled with water. Put a plane mirror strip in it lengthwise. This is our prism set up. Now take this set up at a place where plenty of Sun light is coming. Adjust the set up such that whatever is reflected by the mirror falls on the wall or some screen which should be white in color. What do you observe? We observe the seven colors instead of white light on the wall. Hence we have made a set up to see the dispersion of light on our own.



Structure of Eye

Human eye has a roughly spherical shape. The outer coat of the eye is white. Its transparent front part is called cornea, behind the **cornea** is a dark muscular structure called **iris**. In the iris there is a small opening called the **pupil**. The size of the pupil is controlled by the iris. The iris is that part of eye which gives iris its distinctive colour.

The lens focuses light on the back of the eye, on a layer called **retina**. It is consist of nerve cells. There are two kinds of cells.

- Cones, which are sensitive to bright light
- Rods, which are sensitive to dim light



Cones sense colour. At the end of

the optic nerve and retina, there are no sensory cells, so no vision is possible at that spot. This is called the **blind spot**.

The impression of an image does not vanish immediately from the retina. It persists there for about 1/16th of a second. So, if still images of a moving object are flashed on the eye at the rate faster than 16 per second, then the eye perceives this object as moving.

The minimum distance at which the eye can see objects distinctly varies with age. The most comfortable distance at which one can read with a normal eye is about 25 cm.

Care of Eyes

It is necessary that we take proper care of our eyes. If there is any problem we should go to an eye specialist. Have a regular checkup. If advised, use suitable spectacles.

Too little or too much light is bad for eyes. Insufficient light causes eyestrain and headaches. Too much light, like that of the sun, a powerful lamp or a laser torch can injure the retina. Do not look at the sun or a powerful light directly.

Never rub eyes. If particles of dust go into eyes, wash eyes with clean water. If there is no improvement go to a doctor. Wash eyes frequently with clean water.

Always read at the normal distance for vision. Do not read by bringing book too close to eyes or keeping it too far.



Lack of vitamin A in foodstuff is responsible for many eye troubles. Most common amongst them is night blindness.

One should therefore include in the diet components which have vitamin A. Raw carrots, broccoli and green vegetables (such as spinach) and cod liver oil are rich in vitamin A. Eggs, milk, curd, cheese, butter and fruits such as papaya and mango are also rich in vitamin A.

Visually Challenged Persons Can Read and Write

Some persons, including children, can be visually handicapped. They have very limited vision to see things. Some persons cannot see at all since birth. Some persons may lose their eyesight because of a disease. Such persons try to identify things by touching and listening to voices more carefully. They develop their other senses more sharply.

However, additional resources can enable them to develop their capabilities further.

Braille System

The most popular resource for visually challenged persons is known as Braille. The present system was adopted in 1932. There is Braille code for common languages, mathematics and scientific notation. Many Indian languages can be read using the Braille system. Visually challenged people learn the Braille system by beginning with letters, then special characters and letter combinations. Methods depend upon recognition by touching. Each character has to be memorised. Braille texts can be produced by hand or by machine. Type writer - like devices and printing machines have now been developed.

