Light - Reflection and Refraction
Introduction of Light

❖ **LIGHT:**
Light is a form of electromagnetic energy that causes the sensation of vision.

Optics :

It is the branch of physics which deals with the study of light. It is mainly divided into three parts :

(i) Geometrical optical or ray options: It deals with the reflection or refraction.

(ii) Wave or physical optics: It is concerned with nature of light and deals with interference diffraction and polarization.

(iii) Quantum optics : It deals with the interaction of light with the atomic entities of matter such as photo electric effect, Atomic excitation etc.

(a) Nature of Light :

Theories about nature of light :

(i) Particle nature of light (Newton's corpuscular theory(: According to Newton light travels in space with a great speed as a stream of very small particles called corpuscles.
This theory was failed to explain interference of light and diffraction of light. So wave theory of light was discovered.

(ii) Wave nature of light : light waves are electromagnetic waves so there is no need of medium for the propagation of these waves. They can travel in vacuum also. The speed of these waves in air or in vacuum in maximum i.e., 3×10^8 m/s

(iii) Quantum theory of light : When light falls on the surface of metals like caesium, potassium etc, electrons are given out. These electrons are called 'photo-electrons' and phenomenon is called 'photo-electric effect.'
This was explained by Einstein. According to Planck light consisted of packets or quantas of energy called photons. The rest mass of photon is zero. Each quanta carries energy E= hv.

$v \rightarrow$ Planck's constant $= 6.6 \times 10^{-34}$ J-s.

$v \rightarrow$ frequency of light

Einstein's photo-electric equation $h(\nu - \nu_0) = \frac{1}{2} m v^2_{max}$.

$h\nu_0$ = amount of energy spent in ejecting and electron out of metal surface.

V_{max}= maximum velocity of the ejected electron.

Some phenomenon's like interference of light, diffraction of light are explained with the help of wave theory but wave theory was failed to explain the photo electric effect of light. It was explained with the help of quantum theory. So, light has dual nature.

(i) Wave nature

(ii) Particle nature

(b) Source of Light :

A body which emits light in all directions is said to be the source of light. The source can be point one or an extended one. The sources of light ware of two types :

(i) **Luminous source :** Any object which by itself emits light is called as a luminous source. E.g. Sun and stars (natural Luminous sources), electric lamps, candles and lanterns (artificial luminous sources).

(ii) **Non-luminous source :** Those objects which do not emit light but become visible only when light from luminous objects falls on them. They are called non-luminous. E.g. Moon, planets (natural non-luminous sources), wood, table (artificial non-luminous sources).

(c) Medium of Light :

Substance through which light propagates or tends to propagate is called medium of light.

(i) **Transparent object :** Bodies that allow light to pass through them i.e. transmit light through them, are called transparent bodies. Eg. Glass, water, air etc.

(ii) **Translucent object :** Bodies that can transmit only a part of light through them are called translucent objects. Eg. Froasted or ground glass, greased paper, paraffin wax.

(iii) **Opaque object :** Bodies that do not allow light to pass through them at all are said to be opaque object, Eg. chair, desk etc.

(d) Rectilinear Propagation of Light :

Light travels in a strength line. In vacuum or air light travels with the velocity of 3×10^8 m/s

(e) Behaviour of Light at the Interface of Two Media :

When light traveling in one medium falls on the surface of a second medium the following three effects may occur :

(i) A part of the incident light is turned back into the first medium. This is called reflection of light.

(ii) A part of the incident light is transmitted into the second medium along a changed direction. This is called refraction of light.

(iii) The remaining third part of light energy is absorbed by the second medium. This is called absorption of light.