

# Electromagnetic Nature of light

Various theories have been put forwarded by scientists to explain the nature of light. These theories are:

1. Corpuscular theory
2. Wave theory
3. Electromagnetic theory
4. Quantum theory

Here we will discuss about the electromagnetic theory of light.

Maxwell predicted the existence of electromagnetic waves. Acc To him electromagnetic waves consists of sinusoidally time varying electric and magnetic field vectors acting at right angles to each

other as well as at right angle to the direction of propagation of waves. These electromagnetic waves does not require any medium for its propagation. Light is an electromagnetic wave and all electromagnetic waves travel with the speed of light,  $c$ .

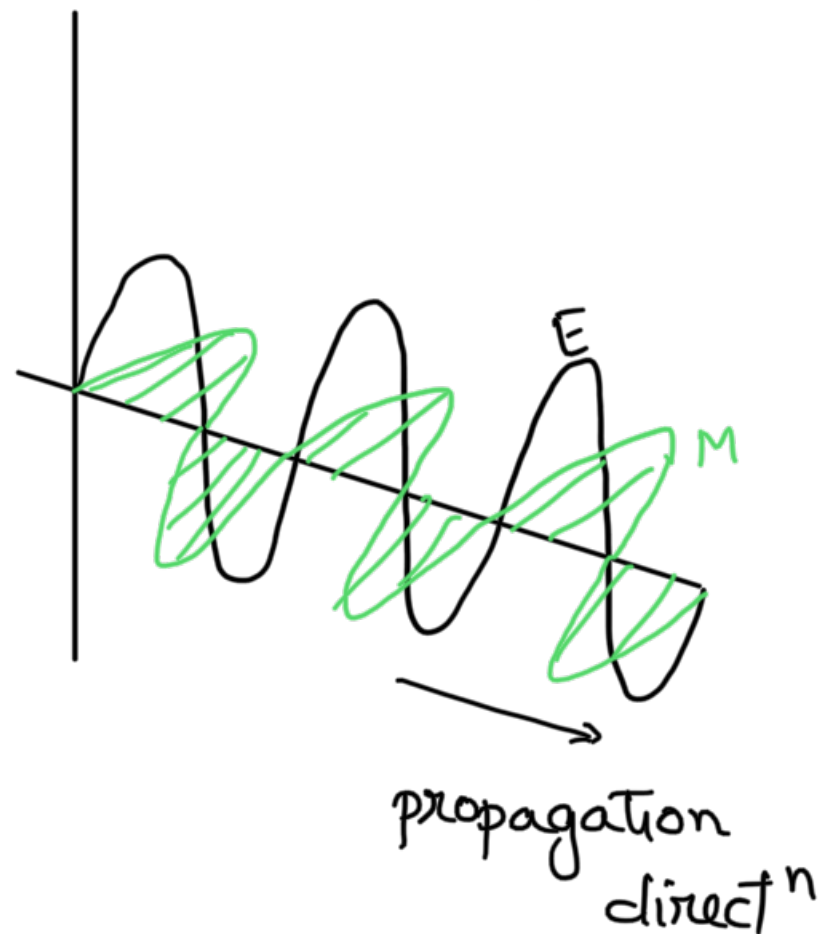
Hence light does not require a medium for propagation.

Note: The velocity of e.m wave is given by

$$v = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

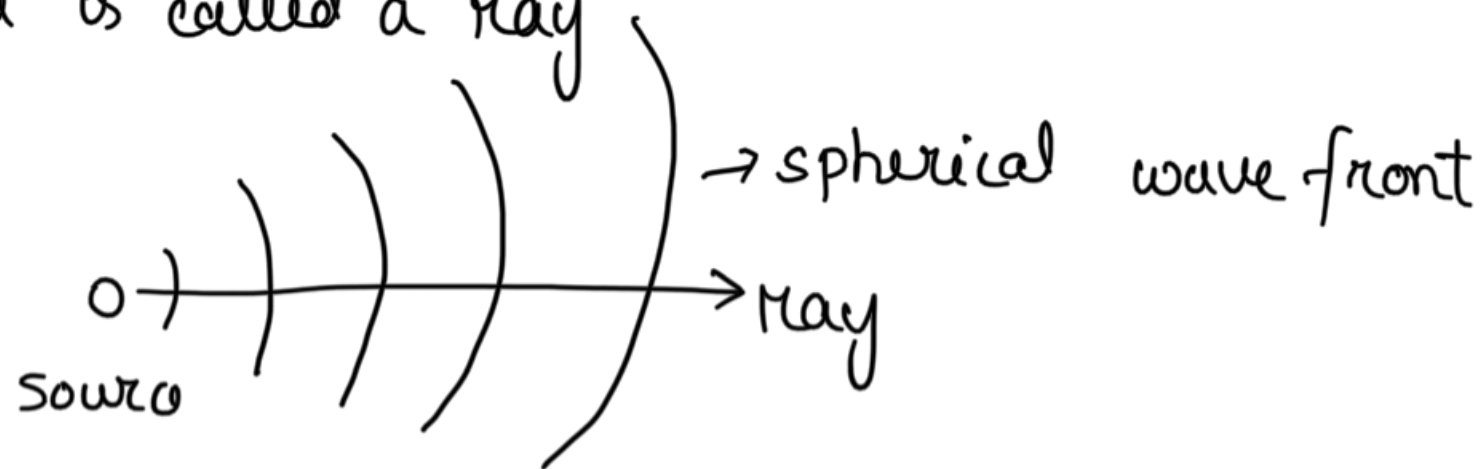
$\mu_0$  = permeability of free space

$\epsilon_0$  = permittivity of free space



Wave Front : Now when a medium is disturbed, waves are produced from its source of disturbance and propagates into new regions of the medium. Consider a stone thrown into a pond, creating disturbance in the water medium. This disturbance will create ripples in water which will travel in outer direction away from the source of disturbance. These wavefronts are circular in shape and the propagation of the wave is visualized by the advancing wavefront. Now all the water molecules on this circular wavefront will be in the same state of motion. So, basically the wavefront at any instant is defined as the locus of all the particles of the medium which are in the same state of vibration. Hence all these particles, are in same phase.

In case of a point light source, the wave fronts are spherical in shape. At considerable distances from the source, a spherical wave front becomes very large and a small portion of it may be considered to be nearly planar. In that case, it is called a planar wavefront. Now a line drawn perpendicular to a wave front is called a ray.



Please go through the video