



Fourth lecture

Introduction to Wave Optics and Wave plates

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Waves

- The concept of wave is used to express the transmission of energy. A wave is a loosening of a medium in which energy travels through this medium without moving matter. In a wave, the particles of the medium are temporarily displaced and then return to their original position. Waves can be classified depending on:
 - 1. The time and place of its propagation are divided into periodic and nonperiodic.
 - 2. In terms of the medium I. Mechanical wave: It needs a medium conductive such as sound waves and water waves.
 - II. The electromagnetic wave: It does not need a conducting medium, but rather it propagates in the space. What is happening here is the transmission of electromagnetic vibrations produced by an oscillating electric field. And a magnetic field is oscillating perpendicular to both fields.
- 3. In terms of disturbance of the transport medium I. Transverse wave: in which the displacement of the particles of the medium from their equilibrium position is perpendicular to the direction of propagation of the wave, such as the wave arising from the vibration of a wire. II. The longitudinal wave: in which the displacement of the particles of the medium is at equilibrium wave propagation direction, like sound waves.
- 4. In terms of the shape of the wave front during propagation I.

Plane wave a wave front is a flat surface. II. A spherical wave: wave front a spherical surface.

❖ *Huygens's Principle*

- ✓ A point source of light would radiate light waves traveling in all directions. This results in spherical waves. A point source emanating spherical waves is shown in Figure [1]. The waves travel in all three dimensions, and, hence, the name. spherical waves. While a point source generates spherical waves, after a certain distance, the waves become planar, i.e. become parallel to each other.

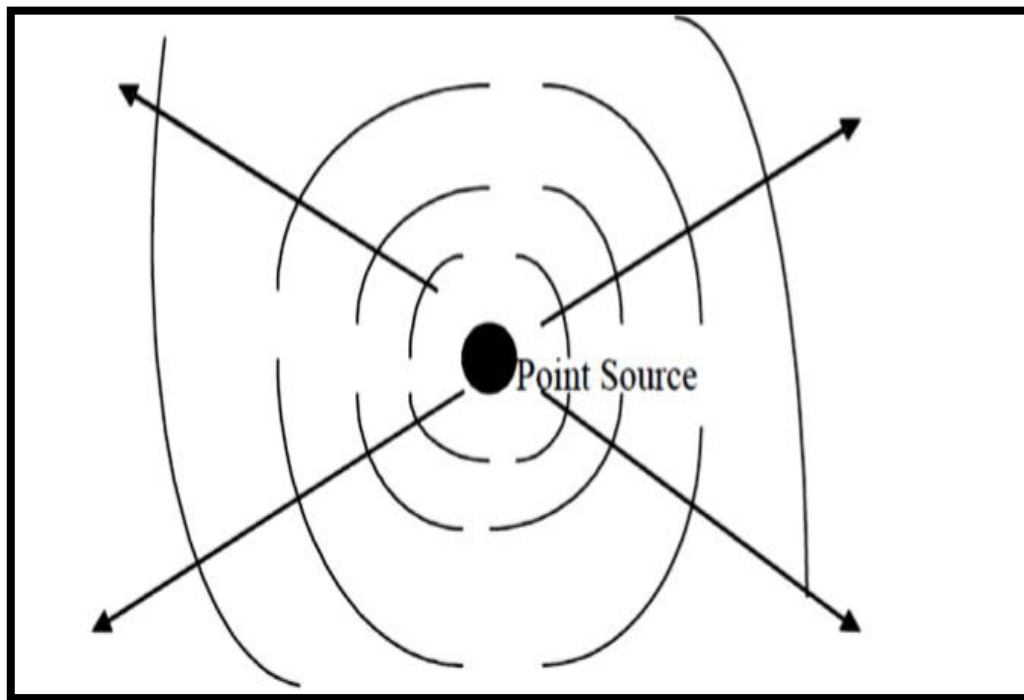


Figure [1]: Spherical waves from a point source

- ✓ A case in point is the sun, which, by virtue of its distance from the earth can be considered a point source. While the waves emanating from the sun are spherical in nature because the sun is a sphere, by the time they reach the earth,

we essentially consider the beam of light to be collimated, i.e., rays of light parallel to each other. As illustrated in Figure [2]

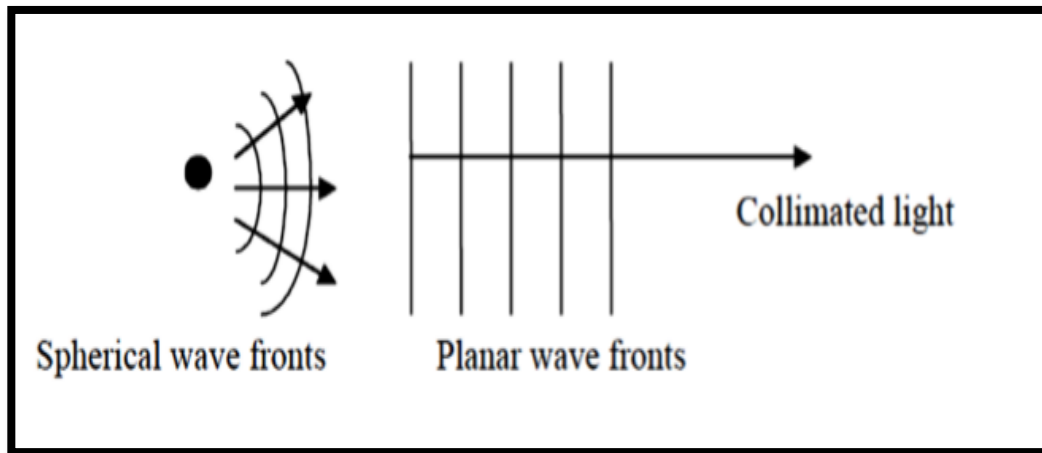


Figure [2]: Spherical waves versus collimated light.