DIFFRACTION OF LIGHT:

Definition

The phenomenon of spreading (or bending) of light wave around corner (or edge) of an aperture or an obstacle.

- ✓ Diffraction can be observed in both mechanical and non-mechanical waves [sound & Light]

[It confirms wave nature but cannot distinguish longitudinal and transverse nature]

Necessary condition for diffraction to occur:

The size of an obstacle (aperture) must be comparable to the wavelength of incident waves.

Result of diffraction of light waves:

Alternate Bright and Dark bands are observed on the screen - called as diffraction bands (or fringes).

- ➢ ***Sound wave can be diffracted through doors and windows.*** $[\lambda_{sound} \approx 1m]$
- ➢ ***Light waves can be diffracted through narrow slits, sharp edges of razor blade or wire.*** $[\lambda_{light} \approx 10^{-7}m]$
- ➢ ***Bragg's diffraction cannot be observed in ordinary light.*** $[Crystal\ spacing \approx 10^{-10}m]$

Types of diffraction.

1. Fresnel's Diffraction	2. Fraunhofer's diffraction.
Spherical or cylindrical wavefront undergoes diffraction. [Difficult to observe and analyze]	Plane wavefront undergoes diffraction [Easy to observe and analyze]
Light source and screen are at finite distance from slit	Light source and screen are at infinite distance from slit
Conversing lenses need not be used	Conversing lenses should be used

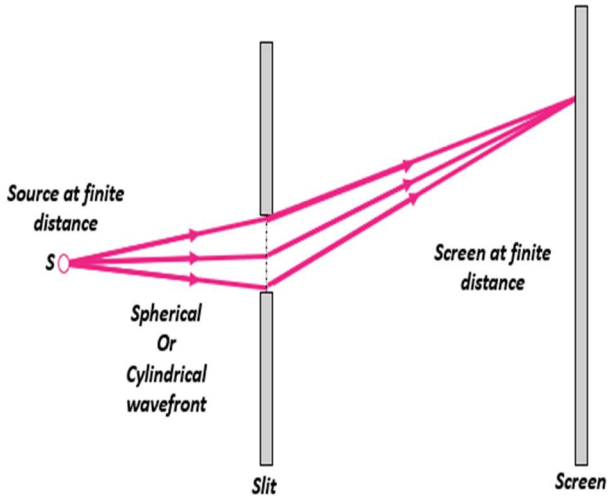

Fig: Fresnel's Diffraction

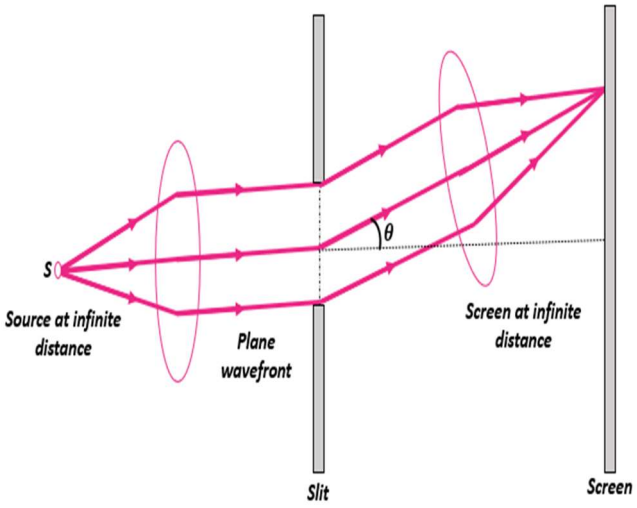

Fig: Fraunhofer's Diffraction

- ✓ **All maxima (bright fringe) are not of same intensity: the central fringe is the most intense one.**
- ✓ Diffraction fringes are not of the same width. [Interference fringes are of same width].
- ✓ **Sound waves are diffracted more easily than light waves in our daily lives.**
- ✓ **When white light is used in interference or in diffraction, the central fringe appears white while other maxima will be colorful.**
- ✓ **Fraunhofer diffraction is easier to analyze because of plane wavefront. (Over Fresnel's diffraction).**