Fresnel's Diffraction

- **Fresnel's assumption's :**

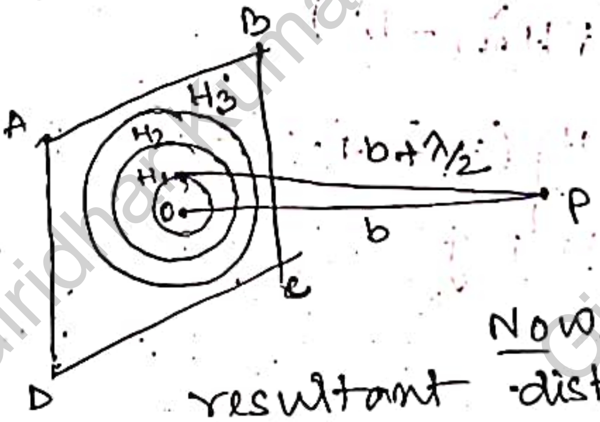
Fresnel gave a satisfactory explanation of this phenomenon by using Huygen's principle in conjunction with the principle of super-position.
According to Huygen's principle each point on the wavefront acts as the source of the secondary waves. The mutual interference of these secondary waves derived from a particular wavefront, produces the phenomenon of diffraction.

- **properties of Fresnel's Diffraction :**

i) Source and the screen are at finite distance from the obstacle/Aperture.
ii) spherical / cylindrical wavefront falls on the obstacle/aperture.
iii) No lenses are used in Fresnel Diffraction.
iv) Waves falling on the obstacle/Aperture will not be in the same phase.
v) Fresnel diffraction is the general case of diffraction, which reduces to Fraunhoffer case when the source and the screen are at infinite distance from the obstacle/Aperture.

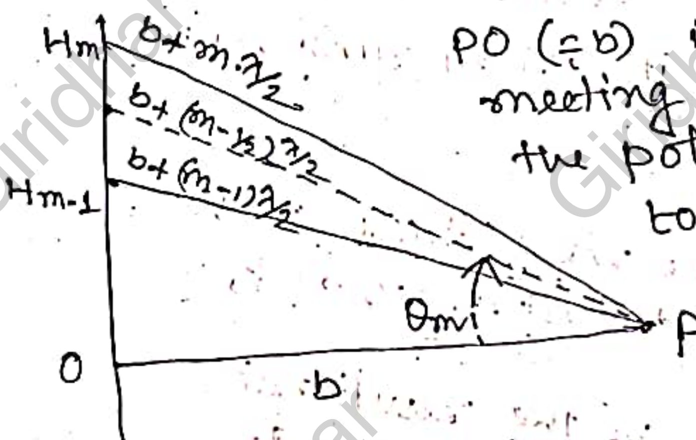
Fresnel's half-period zones of a plane wavefront and their applications......

...The phenomena ~~based~~ of diffraction of light on the basis of the mutual interference of the secondary waves or wavelets from the various points of a wavefront.



Let ABCD be the plane wavefront of light of wavelength λ. ~~advancing to the right~~

Now, we have to find out the resultant disturbance at P due all the wavelets coming from every points of the wavefront, the whole wavefront is divided into a Fresnel half-period zones in the following way.



Now at P, a perpendicular PO (= b) is drawn on the wavefront meeting it at O which is called the pole of the wave with respect to P. With P as centre and radii $(b+\lambda/2)$, $(b+\frac{2\lambda}{2})$, $(b+\frac{3\lambda}{2})$ ... etc. spheres are drawn the sections of which by the plane of the wavefront are concentric circles H_1, H_2, H_3 etc. The area enclosed by the circle H_1 is called first half period zone. The annular zone between the circles H_1 and H_2 is called second half-period zone, and so on.