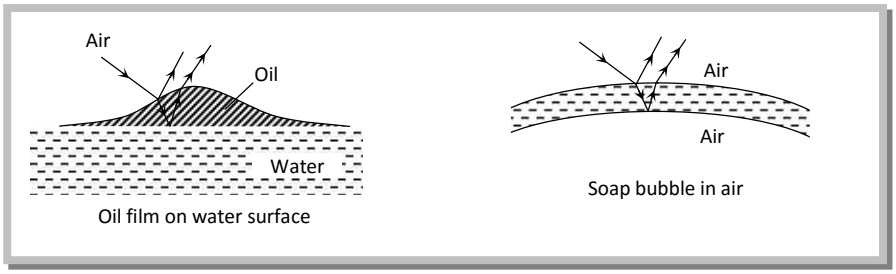
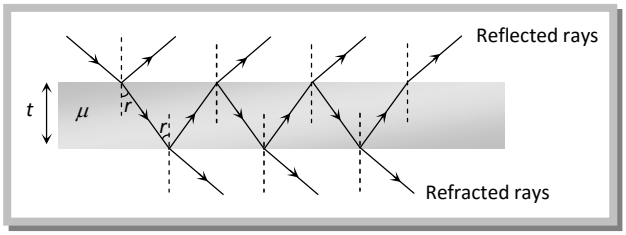
Illustrations of Interference.

Interference effects are commonly observed in thin films when their thickness is comparable to wavelength of incident light (If it is too thin as compared to wavelength of light it appears dark and if it is too thick, this will result in uniform illumination of film). Thin layer of oil on water surface and soap bubbles shows various colors in white light due to interference of waves reflected from the two surfaces of the film.



(1) Thin films: In thin films interference takes place between the waves reflected from its two surfaces and waves refracted through it.



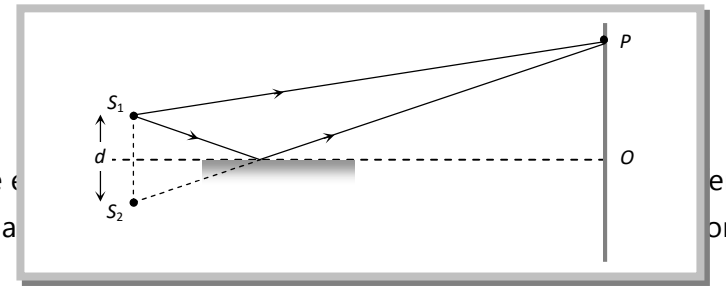
Interference in reflected light	Interference in refracted light
Condition of constructive interference (maximum intensity) $\Delta = 2\mu\ t\cos r = (2n \pm 1)\frac{\lambda}{2}$ For normal incidence r = 0 so $2\mu t = (2n \pm 1)\frac{\lambda}{2}$	Condition of constructive interference (maximum intensity) $\Delta = 2\mu t\cos r = (2n)\frac{\lambda}{2}$ For normal incidence $2\mu t = n\lambda$
Condition of destructive interference (minimum intensity) $\Delta = 2\mu t\cos r = (2n)\frac{\lambda}{2}$ For normal incidence $2\mu t = n\lambda$	Condition of destructive interference (minimum intensity) $\Delta = 2\mu t\cos r = (2n \pm 1)\frac{\lambda}{2}$ For normal incidence $2\mu t = (2n \pm 1)\frac{\lambda}{2}$

Note: The Thickness of the film for interference in visible light is of the order of $10{,}000\ \mathring{A}$.

(2) Lloyd's Mirror

A plane glass plate (acting as a mirror) is illuminated at almost grazing incidence by a light from a slit S1. A virtual image S2 of S1 is formed closed to S1 by reflection and these two act as coherent sources. The expression giving the fringe width is the same as for the double slit, but the fringe system differs in one important respect.

In Lloyd's mirror, if the point P, for example, is such that the path difference $S_2P - S_1P$ is a whole number of wavelengths, the fringe at P is dark not bright. This is due to 180o phase change which occurs when light is reflected from a denser medium. This is equivalent to adding an extra half wavelength to the path of the reflected wave. At grazing incidence a fringe is formed at O, where the geometrical path difference between the direct and reflected waves is zero and it follows that it will be dark rather than bright.



Thus, whenever there e ering beams of light, conditions of ma or minimum intensity)

and $\Delta x = (2n-1)\lambda/2$ (for maximum intensity)