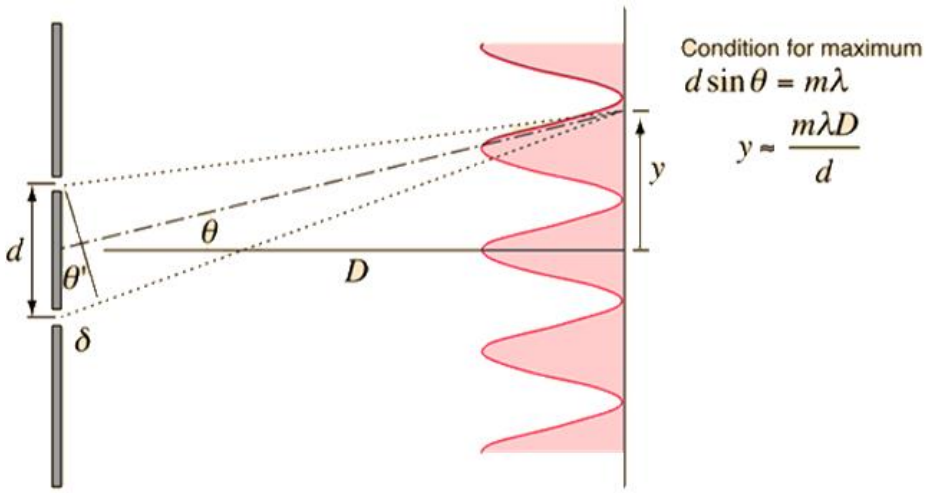
Answer on Question #61775, Physics / Optics

What will be the change in fringe pattern in young double slit experiment even if either or the slits are emerged in a liquid of refracting indices β

Solution:



The distance between two adjacent bright spots on the screen is

$$y \approx \frac{m\lambda D}{d}$$

where m is order of interference, D is distance to screen, d is distance between slits.

As the speed of light is reduced in the slower medium, the wavelength is shortened proportionately.

$$\lambda_\beta = \frac{\lambda}{\beta}$$

Thus

$$y_\beta \approx \frac{m\lambda_\beta D}{d} = \frac{m\lambda D}{\beta d} = \frac{y}{\beta}$$

Answer: When the experiment is immersed in liquid, the wavelength of light decreases because the index of refraction of liquid is higher than that of air. Since the positions of the centers of the bright bands depend on the wavelength of light, light with a smaller wavelength will produce interference fringes that are more closely spaced; the higher the index of refraction, the more closely spaced are the fringes.