Review: The nature of light and wave optics

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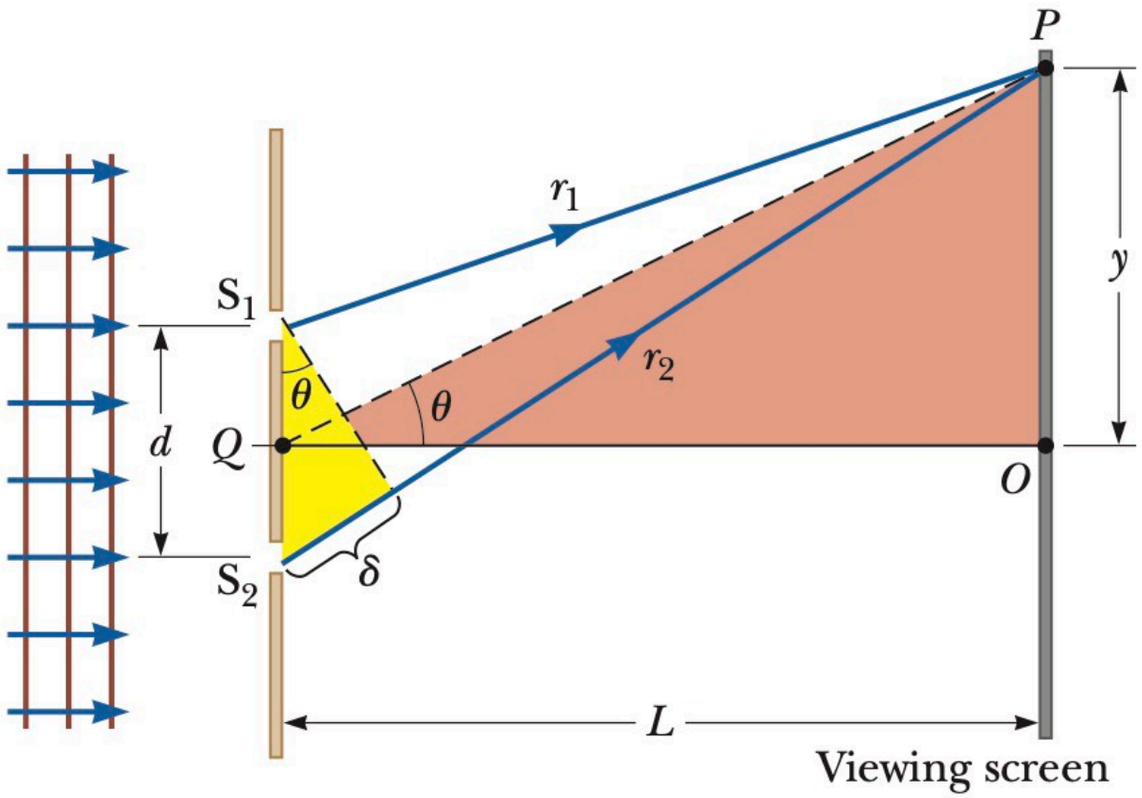
Exercise-1

In Young's experiment, two slits are separated by $d = 0.320$ mm. A beam of 500 nm light strikes the slits, producing an interference pattern. Determine the number of maxima observed in the angular range $-45.0^\circ < \theta < 45.0^\circ$

Exercise-2

Coherent light rays of wavelength λ strike a pair of slits separated by distance d at an angle θ_1 with respect to the normal to the plane containing the slits as shown in the figure. The rays leaving the slits make an angle u with respect to the normal, and an interference maximum is formed by those rays on a screen that is a great distance from the slits. Show that the angle θ_2 is given by $\theta_2 = \sin^{-1}(\sin\theta_1 - \frac{m\lambda}{d})$

Exercise-3



In the double slit experiment, supposed $d = 0.100$ mm and $L = 1.00$ m, and the incident light is monochromatic with a wavelength 500 nm.

- What is the phase difference between two waves arriving at a point P on the screen with $\theta = 0.8^{\circ}$
- What is the phase difference between two waves arriving at a point P on the screen when $y = 4.0$ mm
- If the path difference is $\delta = \lambda/4$, what is the value of θ

Exercise-4

The intensity on the screen at a certain point in a double slit interference pattern is 60% of the maximum value. (A) What minimum phase difference (in radian) between sources produces this result? (B) Express this phase difference as a path difference for 500 nm light.

Exercise-5

Two glass plates 10.0 cm long are in contact at one end and separated at the other end by a thread with a diameter $d =$ 0.05 mm as shown in the figure. Light containing the two wavelengths of 400 nm and 600 nm is incident perpendicularly and viewed by reflection. At what distance from the contact point is the next dark fringe?