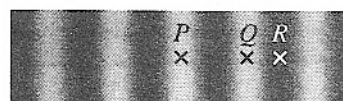


# WAVE PROPERTIES OF LIGHT

Name \_\_\_\_\_

1. A distant point source of red light, a mask with two identical, very narrow slits, and a screen are arranged as shown in the top view diagram below right.

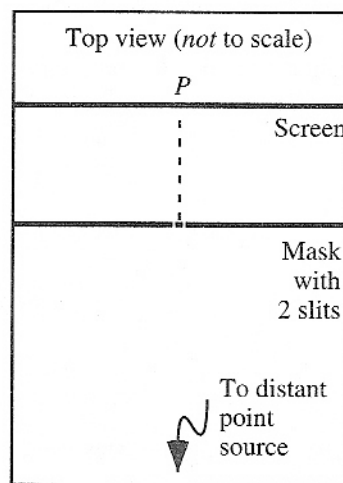
The photograph at right shows the pattern that appears on a distant screen. Point  $P$ , the center of the pattern, and point  $Q$  are maxima. Point  $R$  marks a minimum to the right of point  $Q$ .



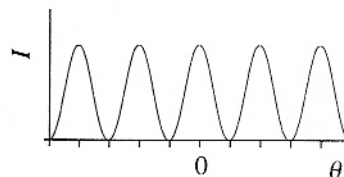
Center of screen

- In the space above the diagram at right, clearly label each of the lettered points according to  $\Delta D$ , the difference in distances from the slits to that point. Express each value of  $\Delta D$  in terms of  $\lambda$ .
- The screen is 2.2 m from the slits, and the distance from point  $P$  to point  $R$  is 1.6 mm.

Determine the distance between the slits in terms of  $\lambda$ . Show your work and describe any approximations that you make in answering this question.



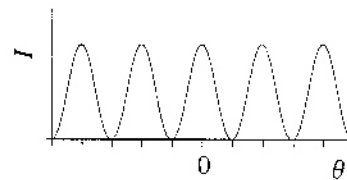
- Suppose that the width of the right slit were decreased (without changing the distance between the centers of the slits).
  - Would the intensity at each of the following points *increase*, *decrease*, or *stay the same*? In each case, explain your reasoning.
    - point  $Q$
    - point  $R$
  - The graph of intensity,  $I$ , vs  $\theta$  shown at right corresponds to the above double-slit experiment. (The angle  $\theta$  is measured relative to the normal to the screen.)



In the space at right, show how the intensity graph would be different if the right slit were made narrower.

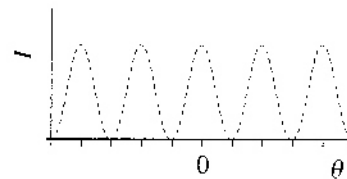
## WAVE PROPERTIES OF LIGHT

2. The graph of intensity,  $I$ , vs  $\theta$  below right corresponds to a double-slit experiment similar to the one described in problem 1.

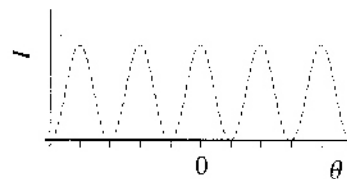


In each part below, suppose that a *single* change were made to the original apparatus. In the spaces provided, show how the graph of  $I$  vs  $\theta$  would be different from the original graph (shown dashed). In each case, *explain your reasoning*.

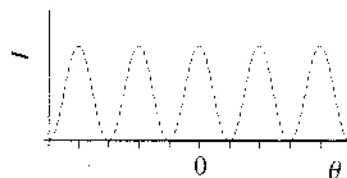
- the distance between the centers of the slits is increased (without changing the width of the slits)



- the wavelength of the incident light is increased



- the distance from the mask to the screen is decreased



- the width of both slits is decreased (without changing the distance between the centers of the slits)

