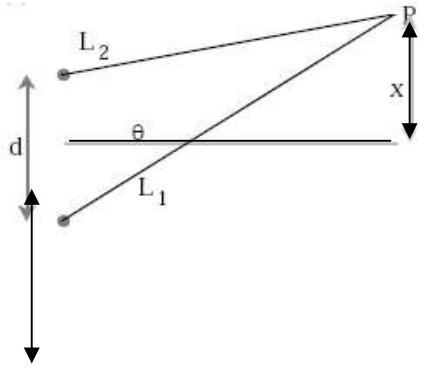
SECTION B – Physical Optics

1. In Young's double slit experiment, the second order bright band of one light source overlaps the third order band of another light source. If the first light source has a wavelength of 660 nm, what is the wavelength of the second light source?
A) 1320 nm B) 990 nm C) 440 nm D) 330 nm

2. A diffraction grating of 1000 lines/cm has red light of wavelength 700 nm pass through it. The distance between the first and third principal bright spots on a screen 2 m away is
A) 14 cm B) 28 cm C) 42 cm D) 140 cm

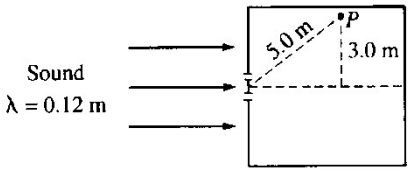
3. In a Young's double-slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to
A) $D/2$ B) $\frac{D}{\sqrt{2}}$ C) $\sqrt{2}D$ D) $2D$

4. Two sources, in phase and a distance d apart, each emit a wave of wavelength λ. See figure below. Which of the choices for the path difference $\Delta L = L_1 - L_2$ will *always* produce destructive interference at point P?
A) d sin θ B) $(x/L_2)d$ C) λ/2 D) 2 λ



5. In an experiment to measure the wavelength of light using a double slit apparatus, it is found that the bright fringes are too close together to easily count them. To increase only the spacing between the bright fringes, one could
A) increase the slit width
B) decrease the slit width
C) increase the slit separation
D) decrease the slit separation

6. Plane sound waves of wavelength 0.12 m are incident on two narrow slits in a box with nonreflecting walls, as shown. At a distance of 5.0 m from the center of the slits, a first-order maximum occurs at point *P*, which is 3.0 m from the central maximum. The distance between the slits is most nearly



(A) 0.09 m (B) 0.16 m (C) 0.20 m (D) 0.24 m

7. If one of the two slits in a Young's double-slit demonstration of the interference of light is covered with a thin filter that transmits only half the light intensity, which of the following occurs?
(A) The bright lines are brighter and the dark lines are darker.
(B) The bright lines and the dark lines are all darker.
(C) The bright lines and the dark lines are all brighter.
(D) The dark lines are brighter and the bright lines are darker.