

### Ch 37. 광파의 간섭

1. Young's double-slit experiment is performed with 589-nm light and a distance of 2.00 m between the slits and the screen. The tenth interference minimum is observed 7.26 mm from the central maximum. Determine the spacing of the slits.
2. Two narrow parallel slits separated by 0.850 mm are illuminated by 600-nm light, and the viewing screen is 2.80 m away from the slits. (a) What is the phase difference between the two interfering waves on a screen at a point 2.50 mm from the central bright fringe? (b) What is the ratio of the intensity at this point to the intensity at the center of a bright fringe?
3. A beam of 580-nm light passes through two closely spaced glass plates, as shown in Figure P37.37. For what minimum nonzero value of the plate separation  $d$  is the transmitted light bright?

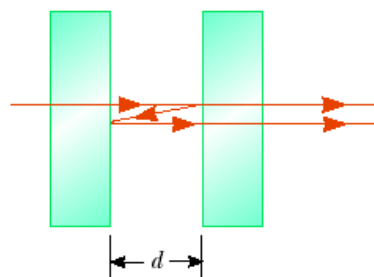


Figure P37.37

4. A piece of transparent material having an index of refraction  $n$  is cut into the shape of a wedge as shown in Figure P37.60. The angle of the wedge is small. Monochromatic light of wavelength  $\lambda$  is normally incident from above, and viewed from above. Let  $h$  represent the height of the wedge and  $\ell$  its width. Show that bright fringes occur at the positions  $x = \lambda\ell(m + 1/2)/2hn$  and dark fringes occur at the positions  $x = \lambda\ell m/2hn$ , where  $m = 0, 1, 2, \dots$  and  $x$  is measured as shown.

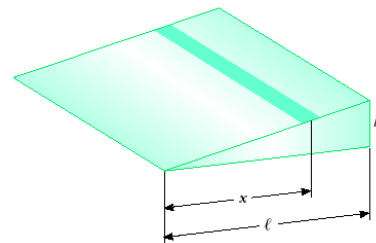


Figure P37.60

5. Consider the double-slit arrangement shown in Figure P37.61, where the slit separation is  $d$  and the slit to screen distance is  $L$ . A sheet of transparent plastic having an index of refraction  $n$  and thickness  $t$  is placed over the upper slit. As a result, the central maximum of the interference pattern moves upward a distance  $y'$ . Find  $y'$ .

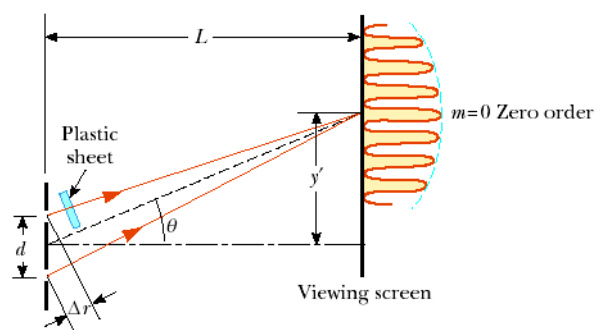
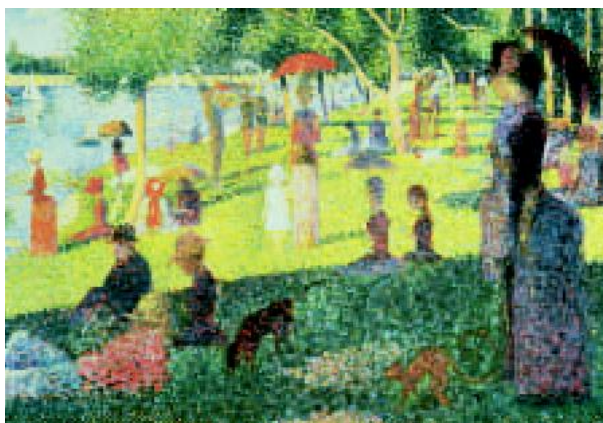


Figure P37.61

Ch. 38. 회절과 편광

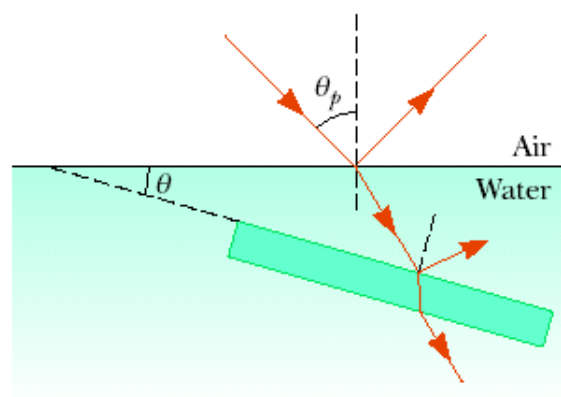
1. A helium–neon laser emits light that has a wavelength of 632.8 nm. The circular aperture through which the beam emerges has a diameter of 0.500 cm. Estimate the diameter of the beam 10.0 km from the laser.
2. The Impressionist painter Georges Seurat created paintings with an enormous number of dots of pure pigment, each of which was approximately 2.00 mm in diameter. The idea was to have colors such as red and green next to each other to form a scintillating canvas (Fig. P38.17). Outside what distance would one be unable to discern individual dots on the canvas? (Assume that  $\lambda = 500$  nm and that the pupil diameter is 4.00 mm.)



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**Figure P38.17:** *Sunday Afternoon on the Island of La Grande Jatte*, by Georges Seurat.

3. A grating with 250 grooves/mm is used with an incandescent light source. Assume the visible spectrum to range in wavelength from 400 to 700 nm. In how many orders can one see (a) the entire visible spectrum and (b) the short-wavelength region?
4. If the interplanar spacing of NaCl is 0.281 nm, what is the predicted angle at which 0.140-nm x-rays are diffracted in a first-order maximum?
5. Light strikes a water surface at the polarizing angle. The part of the beam refracted into the water strikes a submerged glass slab (index of refraction, 1.50), as shown in Figure P38.58. The light reflected from the upper surface of the slab is completely polarized. Find the angle between the water surface and the glass slab.



**Figure P38.58**