Ch37 (Homework)
Current Score : – / 13 **Due :** Monday, August 27 2018 02:34 PM CDT

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1. –/1 pointsSerPSE9 37.P.002.

Light of wavelength 4.80 × 10^2 nm illuminates a pair of slits separated by 0.310 mm. If a screen is placed 1.80 m from the slits, determine the distance between the first and second dark fringes.

[ ] mm

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2. –/2 pointsSerPSE9 37.P.008.

In a Young's double-slit experiment, two parallel slits with a slit separation of 0.130 mm are illuminated by light of wavelength 566 nm, and the interference pattern is observed on a screen located 3.95 m from the slits.

(a) What is the difference in path lengths from each of the slits to the location of the center of a fourth-order bright fringe on the screen?

[ ] µm

(b) What is the difference in path lengths from the two slits to the location of the center of the fourth dark fringe away from the center of the pattern?

[ ] µm

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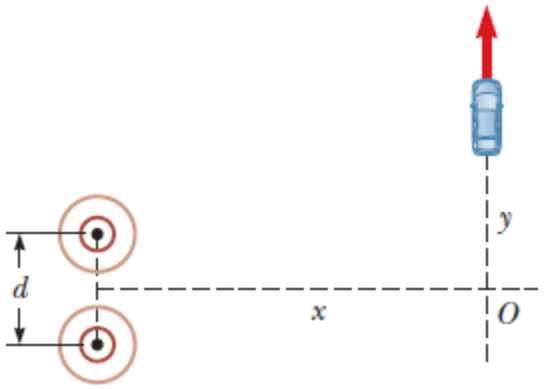
3. –/2 pointsSerPSE9 37.P.013.MI.FB.

Two radio antennas separated by d = 310 m as shown in the figure below simultaneously broadcast identical signals at the same wavelength. A car travels due north along a straight line at position x = 1500 m from the center point between the antennas, and its radio receives the signals. *Note*: Do not use the small-angle approximation in this problem.



(a) If the car is at the position of the second maximum after that at point O when it has traveled a distance y = 400 m northward, what is the wavelength of the signals?

[ ] m

(b) How much farther must the car travel from this position to encounter the next minimum in reception?

[ ] m

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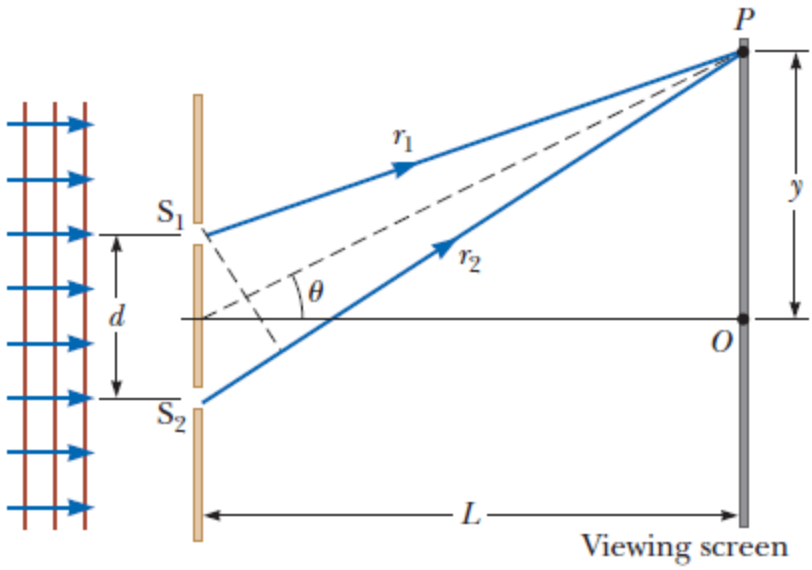
4. –/1 pointsSerPSE9 37.P.025.MI.

In the figure below, let L = 110 cm and d = 0.280 cm. The slits are illuminated with coherent 600-nm light. Calculate the distance y from the central maximum for which the average intensity on the screen is 75.0% of the maximum.

[ ] μm



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5. –/4 pointsSerPSE9 37.P.030.

A soap bubble (n = 1.32) floating in air has the shape of a spherical shell with a wall thickness of 104 nm.

(a) What is the wavelength of the visible light that is most strongly reflected?

[ ] nm

(b) Explain how a bubble of different thickness could also strongly reflect light of this same wavelength.

This answer has not been graded yet.

(c) Find the two smallest film thicknesses larger than 104 nm that can produce strongly reflected light of the same wavelength. (Enter your answers from smallest to largest.)

[ ] nm

[ ] nm

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6. –/1 pointsSerPSE9 37.P.031.WI.

A thin film of oil (n = 1.30) is located on smooth, wet pavement. When viewed perpendicular to the pavement, the film reflects most strongly red light at 640 nm and reflects no blue light at 427 nm. How thick is the oil film?

[ ] nm

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7. –/1 pointsSerPSE9 37.P.033.MI.FB.

A possible means for making an airplane invisible to radar is to coat the plane with an antireflective polymer. If radar waves have a wavelength of 2.76 cm and the index of refraction of the polymer is n = 1.66, how thick would you make the coating? (Assume that the index of refraction of the plane is higher than that of the coating. Also assume that the radar waves are normal to the surface of the coating. Give the minimum thickness that would make the airplane invisible to radar.)

[ ] cm

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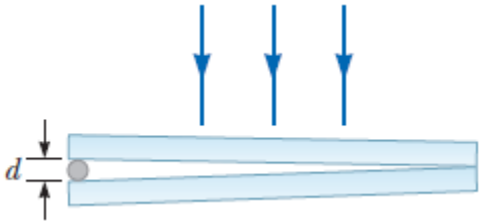
8. –/1 pointsSerPSE9 37.P.037.MI.FB.

An air wedge is formed between two glass plates separated at one edge by a very fine wire of circular cross section as shown in the figure below. When the wedge is illuminated from above by 620-nm light and viewed from above, 27 dark fringes are observed. Calculate the diameter d of the wire.

[ ] μm



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