

Chapter

# 16

HOLT PHYSICS

# Mixed Review

## *Interference and Diffraction*

1. The second-order bright fringes of interference are observed at an  $8.53^\circ$  angle in a double-slit experiment with light of  $5.00 \times 10^2$  nm wavelength.

a. Determine the slits' separation.

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b. Find the angle of the tenth-order bright fringe.

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c. In this experiment, the screen is 2.00 m wide. Its distance from the source is 1.00 m. Could the tenth-order fringe be observed? Why or why not?

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2. Diffraction of white light with a single slit produces bright lines of different colors.

a. Which wavelengths are more diffracted by the same slit size?

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b. In the space below, sketch a diagram showing the location of red, green and blue lines of the first and second order. Describe the sequence in which the colors appear, beginning with the color closest to the center.

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c. What is the color of the central image?

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**3.** You have three diffraction gratings. Grating A has  $2.0 \times 10^5$  lines per meter. Grating B has  $9.0 \times 10^6$  lines per meter. Grating C has  $3.0 \times 10^7$  lines per meter.

**a.** What is the slit distance of each grating?

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**b.** Which gratings can diffract the following:

- visible light of 500 nm wavelength

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- X rays of 5.00 nm wavelength

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- infrared light of 5000 nm wavelength

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**4.** You drop pebbles into the water on a rocky beach. When the waves you made reach the rocks, new waves appear to start in the spaces between the rocks.

**a.** Are these waves coherent?

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**b.** How is this like a double slit illuminated by a single light source?

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