

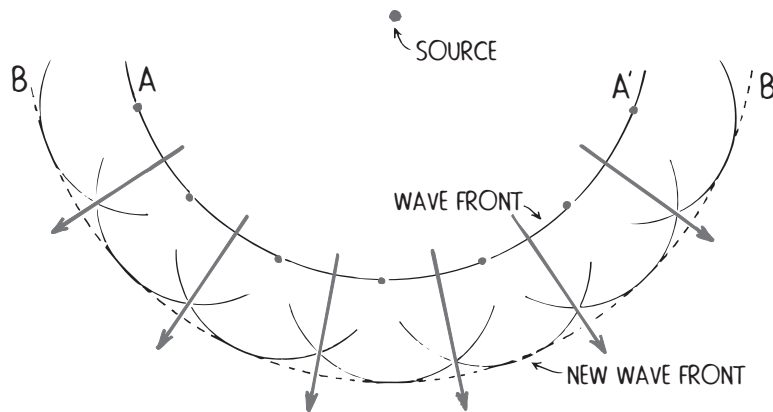
Chapter 31 Diffraction and Interference

Exercises

31.1 Huygens' Principle (pages 623–624)

1. What does Huygens' principle state?

2. Describe what the dots on spherical wave front AA' represent in the illustration below.



3. Is the following sentence true or false? When water waves are forced through a narrow opening, the wave fronts spread out into the “shadow region” in accord with Huygens' principle. _____

31.2 Diffraction (pages 625–627)

4. Any bending of a wave by means other than reflection or refraction is called _____.

5. What happens when light passes through a narrow slit?

6. Explain why many areas have poor FM radio reception, but good AM reception.

7. Is the following sentence true or false? If the size of an object viewed in a microscope is the same as the wavelength of light, the image of the object will be blurred by diffraction. _____

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8. Circle the letter of each statement that is true.
- a. When light is of a single color, diffraction can produce sharp diffraction fringes at the edge of the shadow.
 - b. In white light, the fringes merge together to create a fuzzy blur at the edge of a shadow.
 - c. The extent of diffraction does not depend on the relative size of the wavelength compared with the size of the obstruction that casts the shadow.
 - d. When the wavelength is long compared with the obstruction, the wave diffracts less.

31.3 Interference (page 628)

9. Within a(n) _____, wave amplitudes may be increased, decreased, or neutralized.

Match each phrase with the correct word or words.

- | | |
|---|---|
| <p>_____ 10. produced when two stones are dropped in the water at the same time</p> <p>_____ 11. produced when the crest of one wave overlaps the crest of another</p> <p>_____ 12. produced when the crest of one wave overlaps the trough of another</p> <p>_____ 13. used to produce water waves under carefully controlled conditions</p> | <p>a. constructive interference</p> <p>b. ripple tank</p> <p>c. destructive interference</p> <p>d. interference pattern</p> |
|---|---|
14. The number of regions of destructive interference in an interference pattern depends on the wavelength of the waves and _____.

31.4 Young's Interference Experiment (pages 629–630)

15. What is monochromatic light? _____
16. What did Thomas Young discover in 1801?

17. Young realized that the bright fringes of light resulted from _____ and that the dark areas resulted from _____.

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18. A multitude of closely spaced parallel slits make up what is called a(n) _____.
19. A prism separates colors of light by _____; a diffraction grating separates colors by _____.

31.5 Interference From Thin Films (pages 631–632)

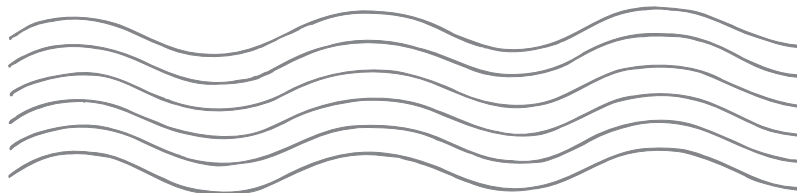
20. How are the colors seen in thin films produced?

21. When gasoline drips on a wet street, you can see a beautiful spectrum of colors. Circle the letter of the word that describes this phenomenon.
- a. reflection
 - b. iridescence
 - c. incoherence
 - d. refraction
22. Is the following sentence true or false? In a soap bubble, light that reflects from one surface may cancel light that reflects from the other surface. _____
23. Extremely small distances (millionths of a centimeter) are measured with instruments called _____.

31.6 Laser Light (pages 633–634)

24. Is the following sentence true or false? Light emitted by a common lamp is coherent. _____
25. What is incoherent light?

26. _____ within a beam of incoherent light is rampant, and a beam spreads out after a short distance, becoming wider and wider and less intense with increased distance.
27. What type of light is illustrated in the drawing below?



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28. Coherent light is many different rays of light that all have the same _____ . Circle the correct answer(s).

- a. frequency
- b. phase
- c. wavelength
- d. direction

29. Is the following sentence true or false? Only a beam of coherent light will not spread and diffuse. _____

30. What do the letters in *laser* stand for?

31. When is laser light emitted?

32. What are two applications for lasers?

31.7 The Hologram (pages 635–636)

33. What is a hologram?

34. Why are holograms used on credit cards?

35. How is a hologram produced?

36. Is the following statement true or false? If a hologram is made on film, you can cut it in half and see the entire image on each half. _____

37. Is a hologram made with X-rays smaller or larger than a hologram made with visible light? _____