longitudinal wave.

25.7 Interference

Interference patterns occur when waves from different sources arrive at the same point—at the same time.

- An **interference pattern** is a regular arrangement of places where wave effects are increased, decreased, or neutralized.
- In **constructive interference,** the crest of one wave overlaps the crest of another and their individual effects add together.

- The result of constructive interference is a wave of increased amplitude.
- In **destructive interference,** the crest of one wave overlaps the trough of another and their individual effects are reduced.
- Destructive interference is also called cancellation.
- When waves are **out of phase,** the crests of one wave overlap the troughs of another to produce regions of zero amplitude.
- When waves are **in phase,** the crests of one wave overlap the crests of another, and the troughs overlap as well.
- Interference is characteristic of all wave motion, whether the waves are water waves, sound waves, or light waves.

25.8 Standing Waves

☑ **A standing wave forms only if half a wavelength or a multiple of half a wavelength fits exactly into the length of the vibrating medium.**

- A **standing wave** is a wave that appears to stay in one place—it does not seem to move through the medium.
- **Nodes** are the stationary points on a standing wave.
- The positions on a standing wave with the largest amplitudes are known as **antinodes.**
- Standing waves are the result of interference. Standing waves can be produced in either transverse or longitudinal waves.

25.9 The Doppler Effect

☑ **As a wave source approaches, an observer encounters waves at a higher frequency. As the wave source moves away, an observer encounters waves with a lower frequency.**

- The apparent change in frequency due to the motion of the source (or receiver) is called the **Doppler effect.** The greater the speed of the source, the greater the Doppler effect.
- The Doppler effect is evident when you hear the changing pitch of a siren as a firetruck passes you. Police make use of the Doppler effect of radar waves in measuring the speeds of cars on the highway.
- The Doppler effect also occurs for light.
- An increase in the frequency of light is called a **blue shift,** because the increase is toward the high-frequency, or blue, end of the color spectrum.
- A decrease in the frequency of light is called a **red shift,** referring to the low-frequency, or red, end of the color spectrum.

25.7 Interference (pages 498–499)

31. A(n) _____ is a regular arrangement of places where wave effects are increased, decreased, or neutralized.

Match each term to its definition.

Term	Definition
____ 32. constructive interference	a. when crests overlap troughs and effects are reduced
____ 33. destructive interference	b. when crests of one wave overlap the crests of another wave
____ 34. out of phase	c. when crests overlap and effects add together
____ 35. in phase	d. when crests and troughs overlap to produce zero amplitude

36. Describe when wave interference occurs.

_____

_____

37. Is the following sentence true or false? Wave interference only occurs with transverse waves. _____

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25.8 Standing Waves (pages 500–501)

38. Is the following sentence true or false? A wave that appears not to move is likely to be a standing wave. _____

39. The points on a standing wave where no motion occurs are called _____.

40. Circle the letter of each statement about antinodes that is true.
    a. They seem not to move.
    b. They occur midway between nodes.
    c. location of largest amplitude
    d. location of zero amplitude

41. Standing waves occur because of _____.

42. Describe the conditions necessary—in terms of wavelength—for a standing wave to form in a rope attached to a wall.

_____

_____

43. Is the following sentence true or false? Standing waves can form in both transverse and longitudinal waves. _____

25.9 The Doppler Effect (pages 501–503)

44. Is the following sentence true or false? A moving wave source does not affect the frequency of the wave encountered by an observer. _____

45. Describe the Doppler effect.

_____

_____

46. Circle the letter of each statement about the Doppler effect that is true.
    a. it occurs when a wave source moves toward an observer
    b. it occurs when an observer moves toward a wave source
    c. it occurs when a wave source moves away an observer
    d. it occurs when an observer moves away from a wave source

47. Is the following sentence true or false? A higher frequency results when a wave source moves toward an observer. _____

48. Two fire trucks with sirens on speed toward and away from an observer as shown below. Identify which truck produces a higher than normal siren frequency and which produces a lower than normal siren frequency.

_____

_____