

# 14 Waves and Energy Transfer

- Sonya hears water dripping from the eaves of the house onto a porch roof. She counts 20 drops in one minute.
  - What is the period of the drops?
  - What is the frequency of the drops?
- You scrape a long nail across a metal file. The speed of the nail is 25 cm/s and the file has grooves that are 1.0 mm apart. What is the frequency of the “clicks” made by the nail?
- Hiroshi is generating waves on a rope by flipping the rope up and down. Each motion up or down lasts 0.20 s. The distance from a crest to a trough is 0.40 m.
  - What is the amplitude of the wave?
  - What is the frequency of the waves?
- Ripples in a pond each have a wavelength of 8.0 cm and frequency of 3.0 Hz. What is the speed of a ripple?
- A Love wave, one of the four types of waves associated with earthquakes, is a transverse wave in which the surface of the earth moves back and forth as the wave passes. What is the period of a Love wave that has speed of 4.1 km/s and a wavelength of 620 km?
- Two pulses, one with a length of 0.30 m and an amplitude of 0.24 m and the other with a length of 0.54 m and an amplitude of  $-0.13$  m, approach each other on a rope.
  - What is the amplitude of the rope at the point where the midpoints of the pulses pass each other?
  - What is the pulse length when the midpoints of the pulses pass each other?
- Figure 14-1a shows a pulse traveling at a speed of 1.0 m/s in a coiled spring to which a second spring is attached at point A. Figure 14-1b shows the springs a few moments later.

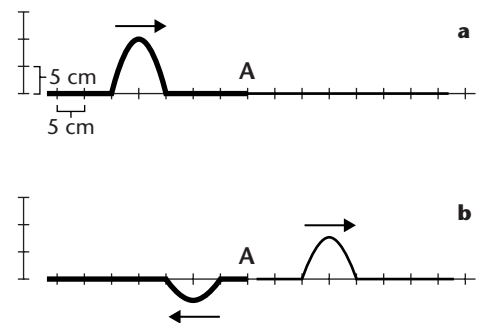


Figure 14-1

- What is the amplitude of the incident pulse?
- What is the speed of the reflected pulse?
- What is the speed of the transmitted pulse?

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8. In Figure 14-2 a pulse is traveling at a speed of 1.0 m/s in a coiled spring to which a second spring is attached at point A. Figure 14-2b shows the location of the transmitted pulse, which has a speed of 0.80 m/s.

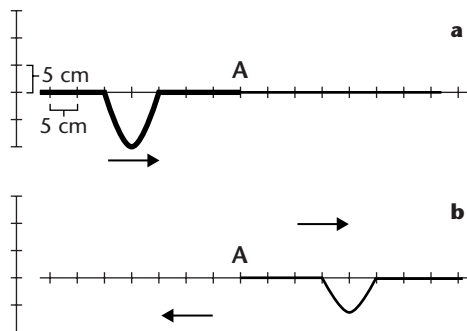


Figure 14-2

- What is the speed of the reflected pulse?
- Is the reflected pulse erect or inverted?

9. A physics teacher attaches an electric oscillator to one end of a 2.0-m long, horizontal spring and attaches the other end to a stationary hook in a wall. She adjusts the frequency of the oscillator to produce a standing wave in the spring. Students observe that the standing wave has 3 nodes and 2 antinodes. She then doubles the frequency of the oscillations and produces another standing wave. How many nodes and antinodes do the students observe in the standing wave?

10. A water wave with a wavelength of 7.0 cm and speed of 21 cm/s moves into a more shallow part of a pond where its wavelength is 6.0 cm.
- What is the frequency of the wave on the shallow water?
  - What is the velocity of the wave in the more shallow water?