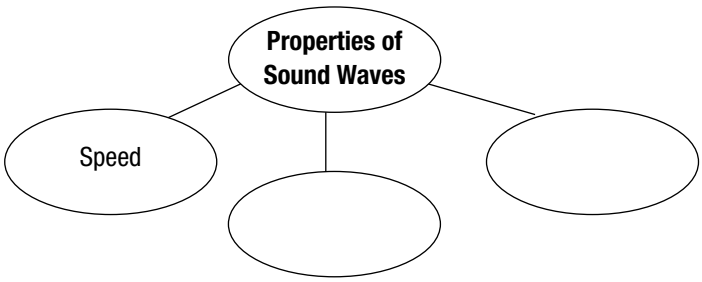
Section 17.4 Sound and Hearing

(pages 514–521)

This section discusses properties of sound waves, how they are produced, and how the ear perceives sound. A description of how music is produced and recorded also is presented.

Reading Strategy (page 514)

Using Prior Knowledge Before you read, add properties you already know about sound waves to the diagram below. Then add details about each property as you read the section. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.



Properties of Sound Waves (pages 514–515)

1. Circle the letter of each sentence that is true about sound.

a. Many behaviors of sound can be explained using a few properties.

b. Sound waves are compressions and rarefactions that travel through a medium.

c. Sound waves usually travel more slowly in solids than in gases.

d. The speed of sound in air is about 30 meters per second.

Match each description with one or more sound properties.

	Description	Property
_____	**2.** This property is measured in units called decibels.	a. loudness
_____	**3.** These properties are affected by the length of tubing in a musical instrument.	b. pitch
_____	**4.** This property is the frequency of a sound as your ears perceive it.	c. intensity
_____	**5.** These properties depend on factors such as your age and the health of your ears.	d. frequency
_____	**6.** This property is a physical response to the intensity of sound.	

Ultrasound (page 516)

7. Is the following sentence true or false? Ultrasound is sound at frequencies that are lower than most people are capable of hearing.
_____

8. Describe some applications of ultrasound. _____
_____

The Doppler Effect (page 516)

9. Is the following sentence true or false? The Doppler effect is a change in sound frequency caused by motion of the sound source, motion of the listener, or both. _____

10. For a stationary observer, as a moving sound source approaches, the observer will first hear a(n) _____ frequency of sound and then a(n) _____ frequency as the source moves away.

Hearing and the Ear (page 517)

Match each description with the appropriate region(s) of the ear.

Description	Region
_____ **11.** Sound is gathered and focused here.	a. outer ear
_____ **12.** Nerve endings send signals to the brain.	b. middle ear
_____ **13.** The eardrum is located at the boundary between these two regions of the ear.	c. inner ear
_____ **14.** Hammer, anvil, and stirrup are located here.	
_____ **15.** Sound vibrations are amplified.	

How Sound Is Reproduced (pages 518–519)

16. How is sound recorded? _____
_____

17. Sound is reproduced by converting _____ back into sound waves.

Music (page 521)

18. Is the following sentence true or false? Many musical instruments vary pitch by changing the frequency of standing waves.
_____

19. Theaters are designed to prevent "dead spots" where the volume is reduced by _____ of reflected sound waves.

20. The response of a standing wave to another wave of the same frequency is called _____.