

Characteristics of Waves • Section Summary

Properties of Waves

Key Concepts

- What are the basic properties of waves?
- How is a wave's speed related to its wavelength and frequency?

There are many different kinds of waves. However, all waves share certain properties. **The basic properties of waves are amplitude, wavelength, frequency, and speed.**

Amplitude is the maximum distance the particles of the medium carrying the wave move away from their rest positions. You can find the amplitude of a transverse wave by measuring the distance from the rest position to a crest or to a trough. The amplitude of a longitudinal wave is a measure of how compressed or rarefied the medium becomes. Very close compressions and very spread out rarefactions mean that a longitudinal wave has a large amplitude. The greater the amplitude of a wave, the more energy it has.

The distance between two troughs or two crests of a transverse wave is the **wavelength**. You can find the wavelength of a longitudinal wave by measuring the distance from one compression to the next compression, or from one rarefaction to the next rarefaction.

The **frequency** of a wave is the number of complete waves that pass a given point in a certain amount of time. Frequency is measured in units called **hertz (Hz)**. A wave that occurs once every second has a frequency of 1 Hz.

The speed of a wave is how far the wave travels in a given amount of time. Speed is equal to the distance the wave travels divided by the time it took to travel that distance.

The speed, wavelength, and frequency of a wave are related to each other by a mathematical formula.

$$\text{Speed} = \text{Wavelength} \times \text{Frequency}$$

$$\text{Frequency} = \frac{\text{Speed}}{\text{Wavelength}}$$

$$\text{Wavelength} = \frac{\text{Speed}}{\text{Frequency}}$$

Properties of Waves (pp. 515–519)

This section describes the basic properties of waves. It also explains how a wave's speed is related to its wavelength and frequency.

Use Target Reading Skills

As you read about the properties of waves, make an outline using the red headings for the main ideas and the blue headings for the supporting ideas.

Properties of waves
<p>I. Amplitude</p> <p style="padding-left: 20px;">A. Amplitude of Transverse Waves</p> <p style="padding-left: 20px;">B.</p>
<p>II. Wavelength</p>
<p>III.</p>

Introduction (p. 515)

1. What are four basic properties of waves?

Amplitude (p. 516)

2. The maximum distance the particles of the medium carrying a wave move away from their rest position is called the wave's

3. Explain what the amplitude of a water wave is.

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4. The amplitude of a wave is a direct measure of its _____.

5. What is the amplitude of a longitudinal wave?

6. Circle the letter of each phrase that correctly defines the amplitude of a transverse wave.

- a. The distance from the bottom of a trough to the top of a crest
- b. The maximum distance the particles of the medium move up or down from their rest position
- c. The maximum distance from one point on the rest position to another point on the rest position
- d. The distance from the rest position to a crest or to a trough

7. Suppose a longitudinal wave has crowded compressions and loose rarefactions. Does it have a large or a small amplitude?

Wavelength (p. 517)

8. The distance between two corresponding parts of a wave is its _____.

9. How can you find the wavelength of a transverse wave?

10. How can you find the wavelength of a longitudinal wave?

Name _____ Date _____

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Properties of Waves (continued)

Frequency (p. 517)

11. The number of complete waves that pass a given point in a certain amount of time is called the wave's _____.
12. If you make a wave in a rope so that one wave passes every second, what is its frequency?
- _____

13. Circle the letter of the unit used to measure frequency.

a. watt
b. seconds
c. joule
d. hertz

Speed (pp. 518–519)

14. The speed of a wave is how far the wave travels in one unit of _____.

Complete the following formulas.

15. Speed = _____

16. Frequency = _____

17. Wavelength = _____

18. Circle the letter of each sentence that is true about the speed of waves.
- a. Speed increases as a wavelength increases.
 - b. In a given medium and under the same conditions, the speed of a wave is constant.
 - c. If the temperature and pressure of air change, the speed of sound waves traveling through the air will change.
 - d. The same wave may travel at different speeds in different mediums.
19. If you increase the frequency of a wave, the wavelength must _____.