Key Concepts — PROPERTIES OF WAVES

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- 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.

$$Speed = Wavelength \times Frequency$$

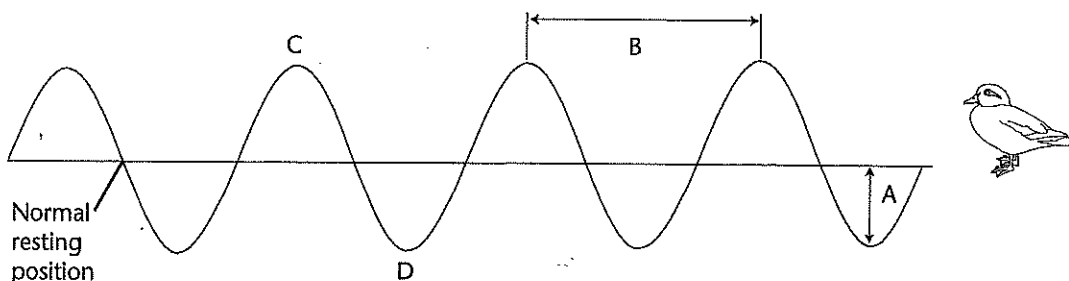$$Frequency = \frac{Speed}{Wavelength}$$

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

Properties of Waves

Understanding Main Ideas

Study the figure below, then circle the letter of the correct answer to each of the questions below.

1. In the diagram above, four complete waves pass the duck in one second. The frequency of this wave is
   a. 8 s.
   b. 4 cm.
   c. 4 Hz.
   d. 1/4 Hz.

2. If this wave travels at 16 cm/s, its wavelength would be
   a. 2 cm.
   b. 16 cm.
   c. 64 cm.
   d. 4 cm.

3. If the wavelength of the above wave is 2 cm and its frequency is unchanged, its speed would be
   a. 16 cm/s.
   b. 14 cm/s.
   c. 2 cm/s.
   d. 8 cm/s.

Building Vocabulary

Fill in the blank to complete each statement.

4. The letter A in the figure above represents the _____ of the wave.

5. The letter B in the figure above represents the _____ of the wave.

6. The letter C in the figure above represents a(n) _____ of the wave.

7. The letter D in the figure above represents a(n) _____ of the wave.