Waves: Introduction and Types

Instructions: Read through the information below. Then complete the statements at the bottom of the page using the BOLD words from the page.

A wave is a transfer of energy through a medium from one point to another. Some examples of waves include: water waves, sound waves, and radio waves. Waves come in two different forms; a Transverse Wave which moves the medium perpendicular to the wave motion, and a Longitudinal Wave, which moves the medium parallel to the wave motion.

Examples of Transverse waves would be a vibrating guitar string or electromagnetic waves, while an example of a Longitudinal wave would be a “Slinky” wave that you push and pull.

Waves have several properties which are represented in the diagrams below. In a Transverse wave the Crest and Troughs are the locations of maximum displacement up or down. The Amplitude is the measurement of maximum displacement. The Wavelength is the distance of one complete wave cycle. For example; the distance from crest to crest or trough to trough would be 1 wavelength.

In a Longitudinal wave, areas of maximum displacement are known as Compressions and Rarefactions. The stronger the wave, the more compressed and spread out the wave medium becomes.

1- Wave motion that is Parallel to wave direction describes a _______________ wave.
2- A ___________ is the maximum upwards displacement in a Transverse wave.
3- One complete wave cycle is referred to as a ____________________.
4- Wave motion that is Perpendicular to wave direction describes a ___________________ wave.
5- A ______________ or ______________ is the maximum displacement in a Longitudinal wave.
6- An Ocean wave would be an example of a ____________________ wave.
7- The distance from one trough to another trough is called a _________________.
8- The measurement of displacement is called a wave’s _____________________.

Fill in the statements using the BOLD words from the above information.
Waves: Velocity and Frequency

Instructions: Read through the information below. Then complete the calculation problems at the bottom of the page.

The velocity of a wave can be calculated if you have enough information. First you need to know the Wavelength, or the length of one complete wave cycle. This could be measured Crest to Crest, Trough to Trough, or any other complete cycle of a wave. The second aspect you need is the wave Frequency, or the number of waves or vibrations produced per second. The frequency is measured in Hertz and the Wavelength is measured in meters.

Wavelength 1 meter

Low Frequency 3 Hz

High Frequency 12 Hz

1 second of time

The equation for calculating the velocity of a wave is:

\[ V = \lambda \times f \]

This equation works for any wave form, water, sound, or radio waves.

EXAMPLE: A wave as a Wavelength of 5 meters and a Frequency of 10 Hz.
What is its velocity?

\[ V = 5 \times 10 \rightarrow V = 50 \text{ meters per second} \]

Solve using the wave velocity equation: (Show your equation set up and math work)

1- A wave has a Wavelength of 12 meters and a Frequency of 10 Hz.
What is its velocity?

2- A wave has a Wavelength of 3 meters and a Frequency of 15 Hz.
What is its velocity?

3- A wave has a Wavelength of 18 meters and a Frequency of .5 Hz.
What is its velocity?

4- A wave has a Wavelength of .5 meters and a Frequency of 100 Hz.
What is its velocity?
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Fill in the statements using the BOLD words from the above information.

1- Wave motion that is Parallel to wave direction describes a _ Longitudinal _ wave.

2- A Crest is the maximum upwards displacement in a Transverse wave.

3- One complete wave cycle is referred to as a Wavelength .

4- Wave motion that is Perpendicular to wave direction describes a Transverse wave.

5- A Compressions or Rarefactions is the maximum displacement in a Longitudinal wave.

6- An Ocean wave would be an example of a Transverse wave.

7- The distance from one trough to another trough is called a Wavelength .

8- The measurement of displacement is called a wave’s Amplitude
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The velocity of a wave can be calculated if you have enough information. First you need to know the **Wavelength**, or the length of one complete wave cycle. This could be measured Crest to Crest, Trough to Trough, or any other complete cycle of a wave. The second aspect you need is the wave **Frequency**, or the number of waves or vibrations produced per second. The frequency is measured in Hertz and the Wavelength is measured in meters.

The equation for calculating the velocity of a wave is:

\[ V = \lambda \times f \]

This equation works for any wave form, water, sound, or radio waves.

**EXAMPLE**: A wave as a Wavelength of 5 meters and a Frequency of 10 Hz. What is its velocity?

\[ V = 5 \times 10 \rightarrow \quad V = 50 \text{ meters per second} \]

**Solve using the wave velocity equation**: (Show your equation set up and math work)

1- A wave has a Wavelength of 12 meters and a Frequency of 10 Hz. What is its velocity?

\[ V = 12 \times 10 = 120 \text{ mps} \]

2- A wave has a Wavelength of 3 meters and a Frequency of 15 Hz. What is its velocity?

\[ V = 3 \times 15 = 45 \text{ mps} \]

3- A wave has a Wavelength of 18 meters and a Frequency of .5 Hz. What is its velocity?

\[ V = 18 \times .5 = 9 \text{ mps} \]

4- A wave has a Wavelength of .5 meters and a Frequency of 100 Hz. What is its velocity?

\[ V = .5 \times 100 = 50 \text{ mps} \]