17.2 Properties Mechanical Waves

**Unit:** 5 - Waves

### Learning Objectives:

1. **Define** frequency, period wavelength and wave speed.
2. **Solve equations** relating wave speed to wavelength and frequency or period.
3. **Describe** how to measure amplitude and **relate** amplitude to the energy of a wave.

### Language Objectives:

* Understand and correctly use the terms “Periodic Motion”, “Period”, “Frequency”, “Hertz”, “Wavelength” “Amplitude”

### Notes: What is the frequency of a wave?

Any periodic motion has a **frequency**, which is the number of complete \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

A wave’s frequency \_\_\_\_\_\_\_\_\_\_\_\_\_ the frequency of the vibrating source producing the wave.

**So then what is periodic motion?**

Any motion that \_\_\_\_\_\_\_\_\_\_\_ at \_\_\_\_\_\_\_\_\_\_\_ intervals is called **periodic motion.**

The time required for \_\_\_\_\_\_\_\_\_ is called the **period.**

Frequency is the number of complete cycles in a given time.

Frequency is measured in cycles per second, or **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**



**What are wavelengths and how are they related to frequency?**

Wavelength is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on one wave and the same point on the next cycle of the wave.

Increasing the frequency of a wave \_\_\_\_\_\_\_\_\_\_\_\_\_\_its wavelength. (Inverse relationship)

For a transverse wave, wavelength is measured between \_\_\_\_\_\_\_\_\_\_\_\_\_\_crests or between adjacent troughs.

For a longitudinal wave, wavelength is the distance between adjacent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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**How are frequency, wavelength and speed related?**

If you assume that waves are traveling at a constant speed, then wavelength is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ proportional to frequency.

When the wavelength is in meters, and the frequency is in hertz, the units for speed are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The speed of a wave is also calculated by dividing its wavelength by its period.

Formula:

**Practice Problem – Wave Equation**

One end of a rope is vibrated to produce a wave with a wavelength of 0.25 meter. The frequency of the wave is 3.0 hertz. What is the speed of the wave?

**More on Wave Speed**

The speed of a wave can change if it enters a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or if variables such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ change.

For many kinds of waves, the speed of the waves is roughly constant for a range of different frequencies.

The wave with the \_\_\_\_\_\_\_\_\_\_\_\_ frequency has a \_\_\_\_\_\_\_\_\_\_ wavelength.

**Amplitude Again & Energy**

The amplitude of a wave is the \_\_\_\_\_\_\_\_\_\_\_\_displacement of the medium from its rest position.

The \_\_\_\_\_\_\_\_\_\_\_\_energy a wave has, the \_\_\_\_\_\_\_\_\_\_\_the amplitude.

The amplitude of a transverse wave is the distance from the rest position to a   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

It takes more energy to produce a wave with higher crests and deeper troughs.

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**Longitudinal Amplitude**

The amplitude of a longitudinal wave is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ displacement of a point from its rest position.

The more energy the wave has, the more the medium will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or displaced.