Waves

If you were to drop a rock in water you would make waves. You know that the waves move away from where you dropped the rock (linear motion), but when the waves pass, the water moves up and down (harmonic motion).

Restoring force: To be harmonic motion, the waves have to have a restoring force. In water waves it is the water molecules. The water is compressed and expanded to cause the up and down (oscillating) motion. All waves do this with molecules they travel through.

Two Types of Waves

Transverse waves (slinky moving side to side or up and down) – moves perpendicular to the direction of the wave. Ocean waves are transverse waves, moving forward, but the oscillating up and down.

Longitudinal waves (also called compression waves – a slinky pushed and pulled) – moves parallel (same direction) to the wave motion. Sound waves are longitudinal waves – the sound moves forward and the oscillations move back and forth.

Earthquakes are made up of both transverse and longitudinal waves. The transverse waves do the most damage.

Speed and Wavelength

Different waves have different speeds and different wavelengths.

Ex. Find the speed of a 20 Hz wave that has a 5 meter wavelength.

\[ f = 20 \text{ Hz} \]
\[ \lambda = 5 \text{ m} \]
\[ v = ? \]

\[ v = f \lambda \]
\[ v = (20 \text{ Hz}) \times (5 \text{ m}) \]
\[ v = 100 \text{ m/s} \]
1. Transverse wave
2. Longitudinal wave
3. Crest
4. Trough
5. Wavelength

A. A wave where the oscillation is perpendicular to the direction of motion.
B. The bottom of a wave.
C. The top of a wave.
D. A wave where the oscillation is in the same direction (parallel) as the motion.
E. The length of one wave cycle.

FM radio: ________________
Music: ________________
A car going 70 m/s: ________
Clock pendulum: __________
Earthquakes: _____________
Ocean waves: ______________
Cellphones: ______________

Wave Motion, Yes or No?

Pendulum A is 20 cm long and has a 5 g mass on it. Pendulum B is 30 cm long and has a 10 g mass on it. Which one has a faster period?

A wave has a wavelength of 2 meters and a frequency of 1.5 Hz. What is its speed?

A wave is 8 meters long and has a frequency of 3 Hz. Find speed.

A wave has a period of 4 seconds. Find its frequency.

A wave has a frequency of 2 Hz. Find its period.

A wave has a speed of 50 m/sec. If its frequency is 100 Hz, what is its wavelength?

Mark 1 cycle of the wave.
Starting at 1 m, where does the next cycle end:
How many wavelengths long is the graph?
Wavelength: Amplitude:
If f = 0.5 Hz, find speed:

Mark 1 cycle of the wave.
Starting at 0.75 m, where does the 2nd cycle end:
Number of complete cycles:
Wavelength: Amplitude:
If f = 4 Hz, find speed:

Mark 1 cycle of the harmonic motion.
Starting at 1.5 secs, when does half a cycle end:
Number of complete cycles:
Period: Frequency:
Amplitude: