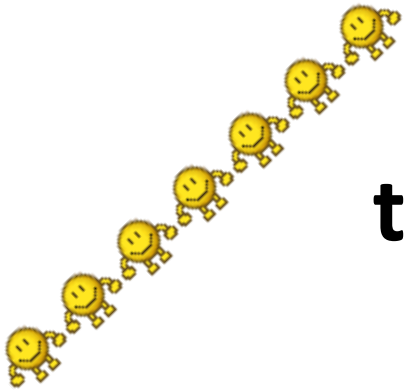
A **wave** is a kind of **oscillation** (disturbance, vibration) that **transports energy** from place to place through space and matter.



# WAVES

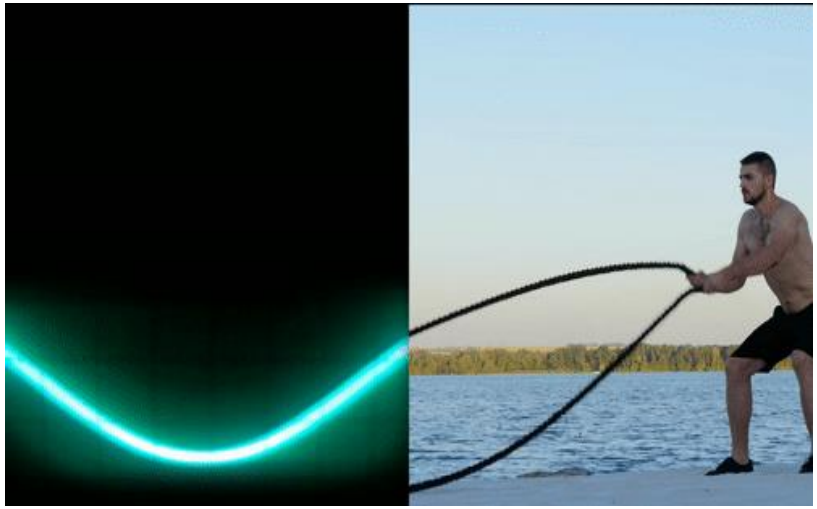
## MECHANICAL:

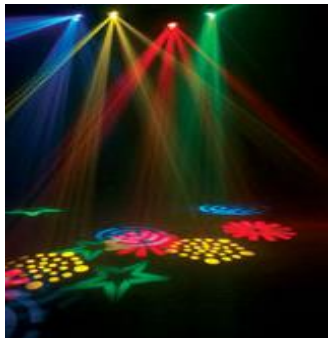
- oscillations of *matter*
- require a medium

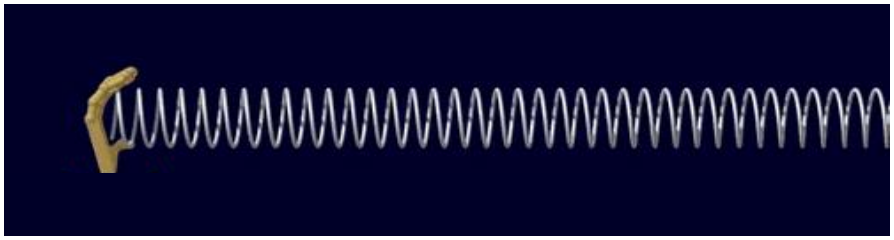
## ELECTROMAGNETIC:

- oscillations of *electric and magnetic field*
- require no medium

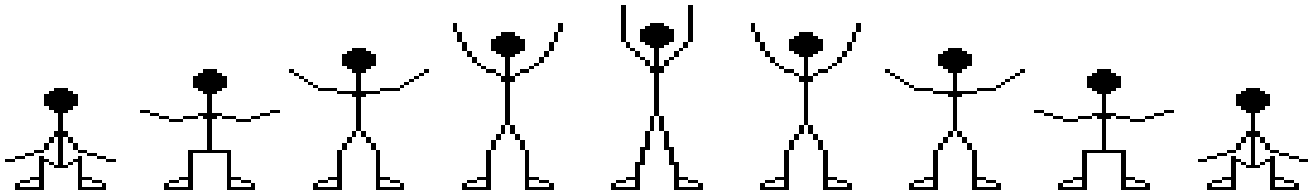
# Examples of waves



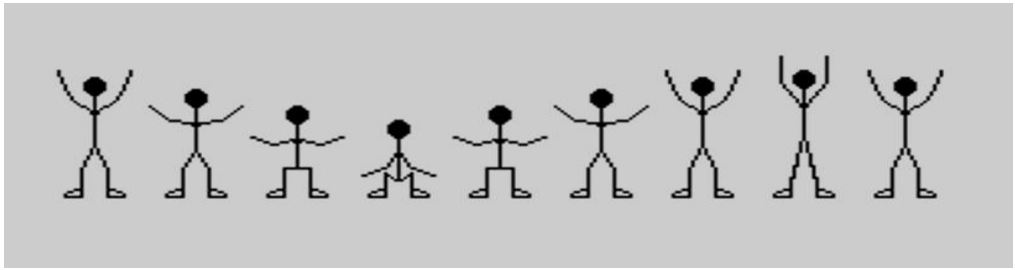


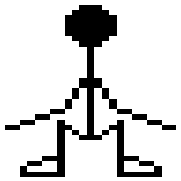
# How to describe a wave?



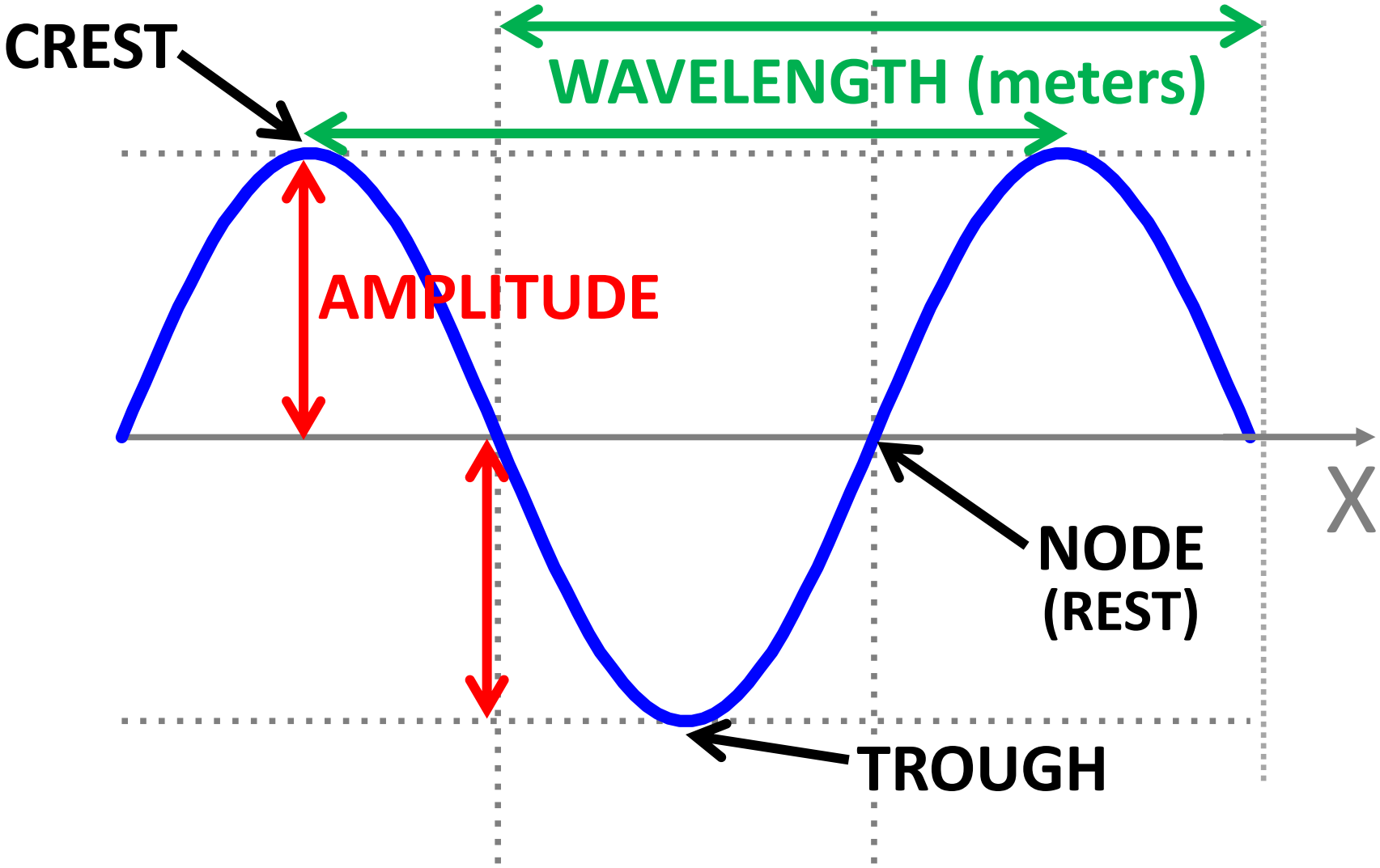
1. Take a "snapshot" – look at wave shape at a particular moment in time.



2. Watch a particular point over time.



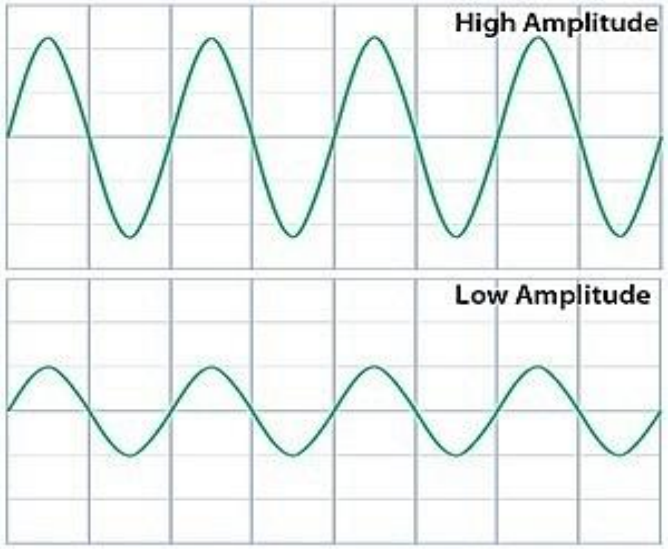
# How to describe a wave in space?

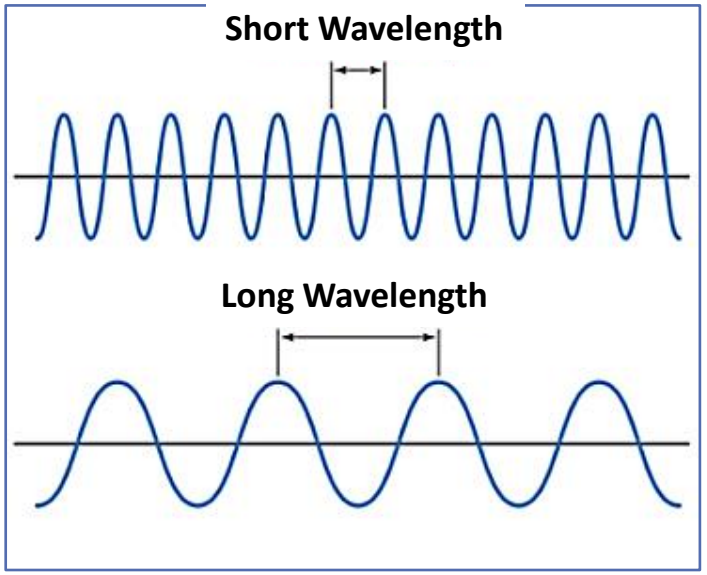


# Notations and Units

**AMPLITUDE (A): maximum amount of vibration measured from the rest position.**

- **Unit of measurement: depends on the physical quantity that is oscillating**
- **Examples: distance (meters), pressure (pascals), electric field strength (volts/meter)**

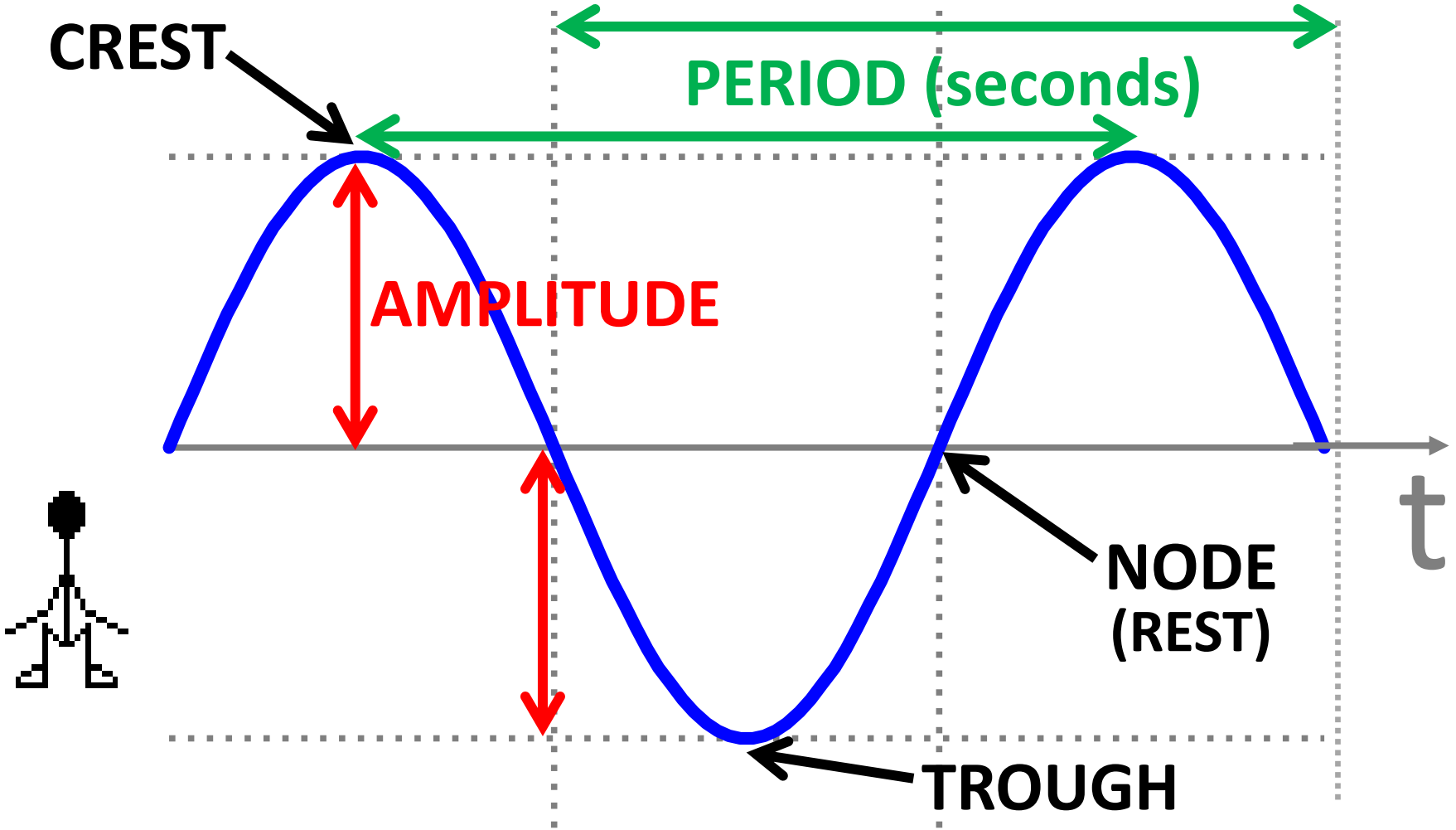



**WAVELENGTH (λ): the distance over which the wave's shape repeats itself.**

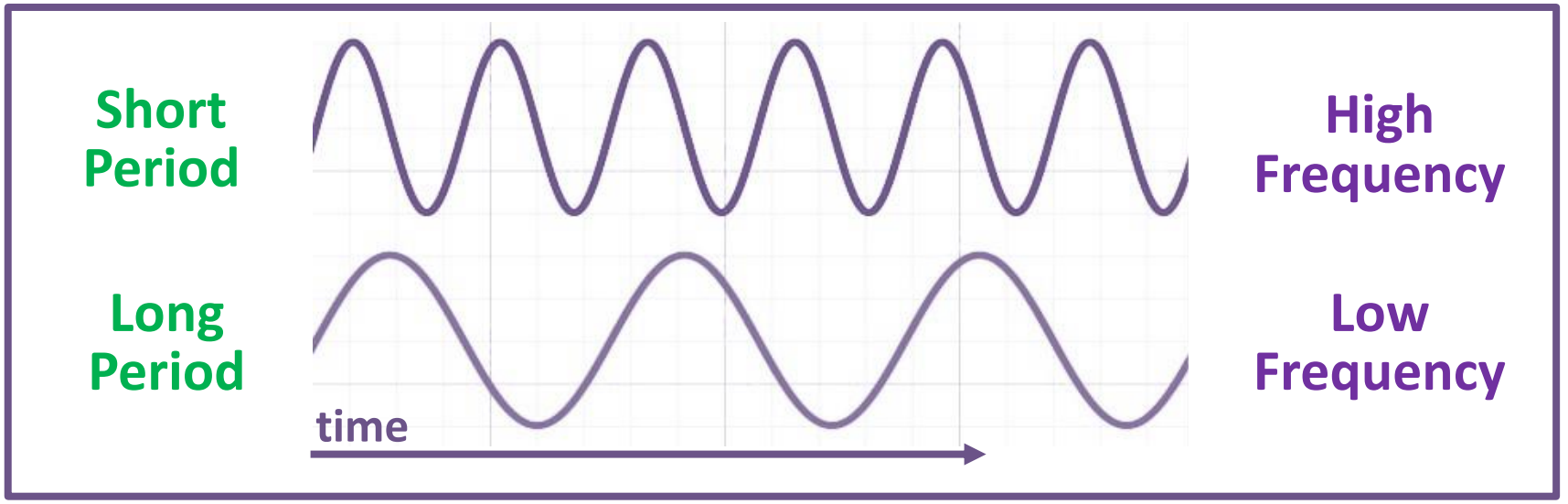
- **Unit of measurement: meters**
- **Examples: the sounds of thunder are waves with wavelengths from few tenths to a few meters; the wavelengths of visible light are in the range of 400 to 750 *nanometers* (billionths of a meter)**

# How to describe a wave in time?




**FREQUENCY: number of waves per second**

# Notations and Units




**PERIOD (T):** The time it takes to make one complete vibrational cycle.

- Unit of measurement: seconds

**FREQUENCY (f):** number of waves per second.

- Unit of measurement: hertz (Hz)

$$\text{FREQUENCY} = \frac{1}{\text{PERIOD}}$$

$$1\text{Hz} = \frac{1}{1\text{s}}$$

**Can you identify two different kinds of mechanical waves that are created when someone plays a musical instrument?**