Waves

- A wave is a transfer of energy, in a form of a disturbance usually through a material substance, or medium.
  - Electromagnetic Waves
  - Sound waves
  - Water waves
  - Pressure waves
  - Gravity waves
  - Matter waves

- When objects repeat a pattern of motion (e.g. a pendulum), we say that object is vibrating or oscillating. (wiimote demo)
  - The oscillation is repeated over and over with the same time interval each time.
  - One complete oscillation is called a cycle.
  - The number of cycles per second is called the frequency, f. The frequency is measured in Hertz (Hz).

⇨ The period, T, usually measured in seconds, is the time required for one cycle. The frequency and period are reciprocals of each other.

$$\text{frequency} = \frac{\text{cycles}}{\text{time}} = \frac{1}{T}$$

$$\text{period} = \frac{\text{time}}{\text{cycle}} = \frac{1}{f}$$

Examples

1. A pendulum completes 30 cycles in 15 seconds. Calculate its frequency and period.

$$f = \frac{\#\text{cycles}}{\text{time}} = \frac{30}{15} = \boxed{2\,\text{Hz}}$$

$$T = \frac{\text{time}}{1\,\text{cycle}} = \frac{15\,\text{s}}{30\,\text{cycle}} = \boxed{0.5\,\text{s}}$$

or

$$T = \frac{1}{f} = \frac{1}{2\,\text{Hz}} = \boxed{0.5\,\text{s}}$$