Reference material:

Chapter 10.4 (pg 248) of JMH Physics

Chapter 8 of MHR

⇨ 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

*Demos to visualize new terms.

⇨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.

Close Read Pg 338 - 339 of MHR. Pay attention to and note the many terms introduced.

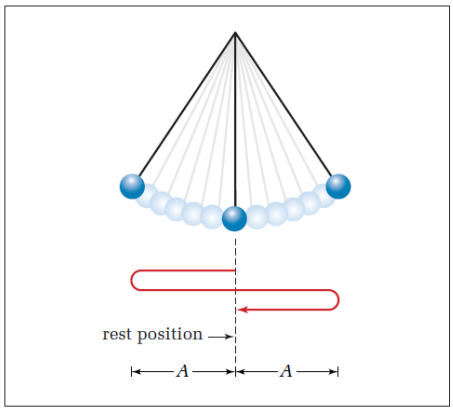
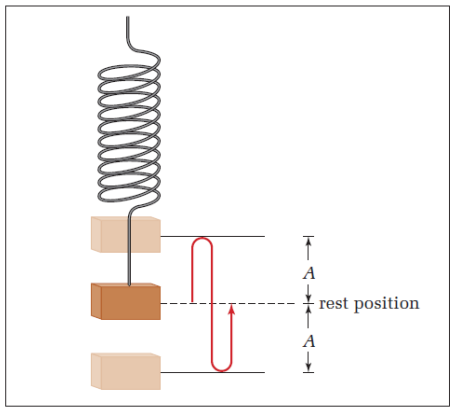


Figure 8.2 **(A)** When a simple pendulum completes one full cycle of its motion, it is in its original position.



(B) One full cycle of the motion of the mass on a spring brings the mass back to the rest position.

PERIOD AND FREQUENCY

The period is the quotient of the time interval and the number of cycles. $T = \frac{\Delta t}{N}$

The frequency is the quotient of the number of cycles and the time interval. $f = \frac{N}{\Delta t}$

The frequency is the reciprocal, or inverse, of the period. $f = \frac{1}{T}$

Quantity	Symbol	SI unit
period	T	s (seconds)
frequency	f	Hz (hertz)
time interval	Δt	s (seconds)
number of cycles	N	none (pure number)

Note: $1\ \text{Hz} = \frac{1}{\text{s}} = 1\ \text{s}^{-1}$

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

$$f = \frac{\#\text{cycles (waves)}}{\Delta t}$$

$$= \frac{30}{15\text{s}} = \boxed{2\ \text{Hz}}$$

$$T = \frac{\Delta t}{\#\text{cycles}} \quad \text{or} \quad T = \frac{1}{f}$$

$$T = \frac{15\text{s}}{30} = \boxed{0.5\text{s}} \quad \text{or} \quad T = \frac{1}{2\ \text{Hz}}$$

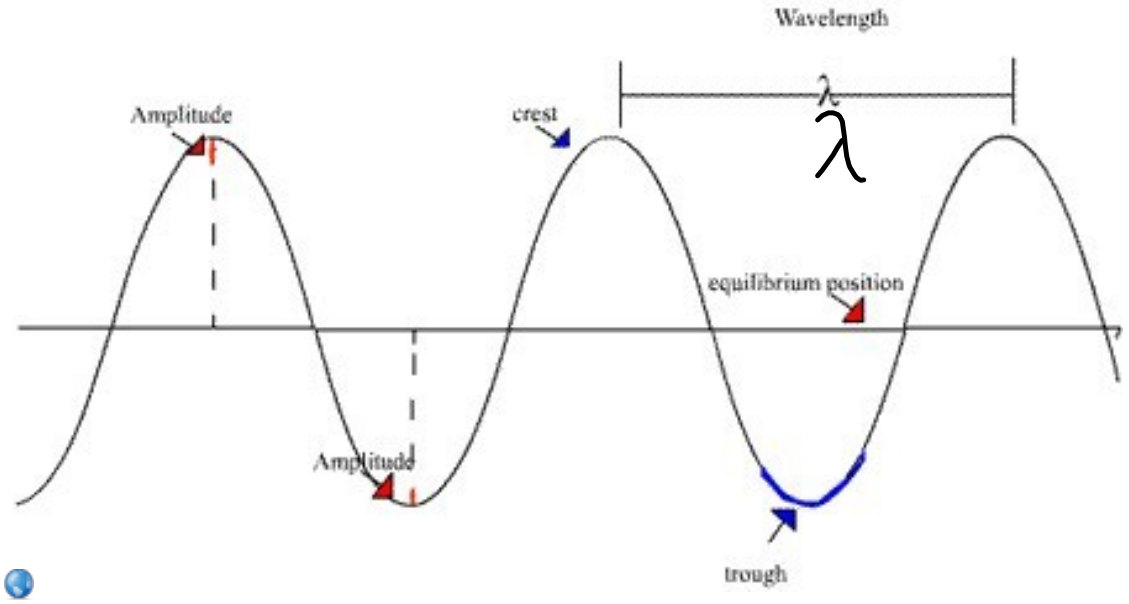
$$\boxed{T = 0.5\text{s}}$$

Read MHR pg 344 - top of 345.

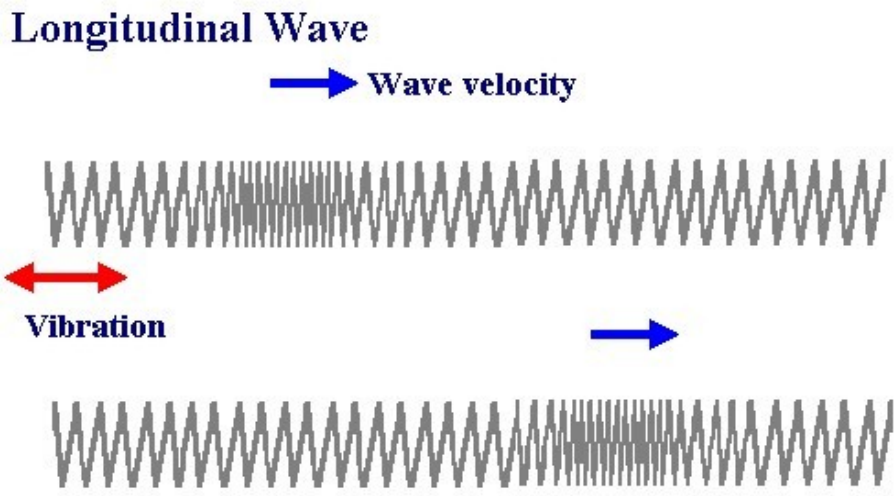
Follow Up Questions:

1. What is a medium when talking about waves?
2. Summarize the properties of mechanical waves.
3. What determines the speed of a mechanical wave? Provide an explanation for your answer.
4. What affect does friction have within a mechanical wave?

Transverse Waves



- The particles in the medium vibrate at right angles to the direction in which the wave travels.
- The high section is called the crest, and the low section is called the trough.
- The height of the crest or depth of the trough, from the equilibrium position is called the amplitude.
- For periodic waves, the distance between successive crests and troughs is equal and is called the wavelength. The symbol for the wavelength is the Greek letter lambda, λ
- The period of a transverse wave is the time it takes for one wavelength (one cycle) to pass a fixed point.
- The frequency is the number of wavelengths that passed a fixed point in one second.
- Examples include water waves and making vibrations on a rope.



Longitudinal Waves

- The vibrations of the particles are parallel to the direction of motion.
- There are a compressions and rarefactions created in longitudinal waves.
- One wavelength is the distance between the midpoints of successive compressions or rarefactions.
- The amplitude is the maximum displacement of the particles from their rest position. Amplitude is a measure of the wave's energy.
- Sound waves, pressure waves are examples.