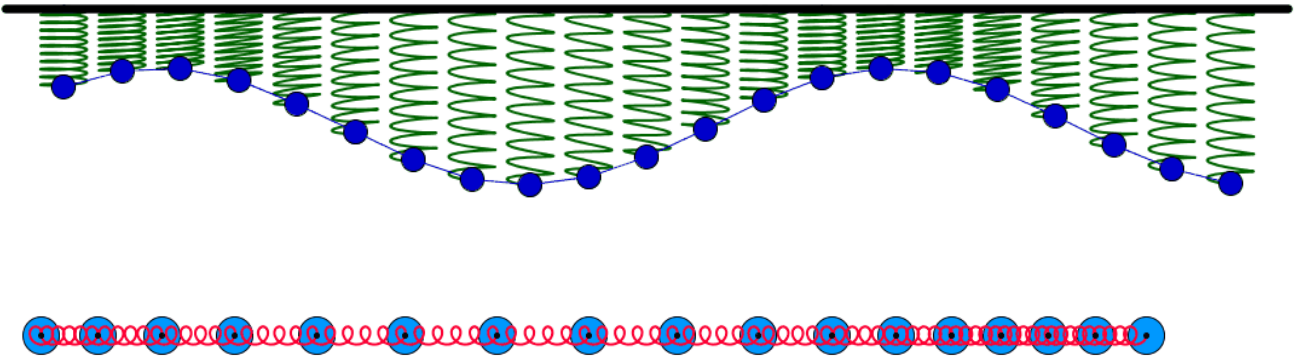


Waves and Sound

Periodic Motion



1. Energy Review
2. Introduction to Periodic Motion
3. Characteristics of Periodic Motion
4. Problem Example

Mechanical Energy

Energy of motion

$$E_k = \frac{1}{2}mv^2$$

Energy of position

$$E_g = mgh$$

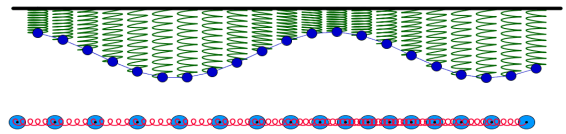
Conservation of Energy

$$E_{Ti} = E_{Tf}$$

total initial energy = total final energy

Introduction to Waves & Sound

Big Ideas

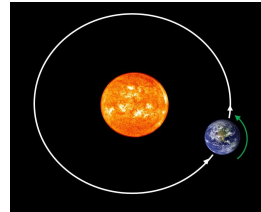


1. Sound be "characterized" as a wave.
2. Waves can be used to represent any periodic or repeating motion.
3. Waves have physical properties such as speed, frequency, length, height, energy

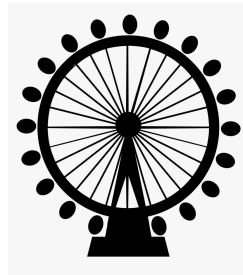
What is Periodic Motion

periodic motion is .. any motion that is repeated on a regular time interval.

→ earth's rotation



→ ferris wheel



→ tides

→ pulse rate, respiration rate

→ moving electric charges or moving masses

electromagnetic radiation

gravitational waves

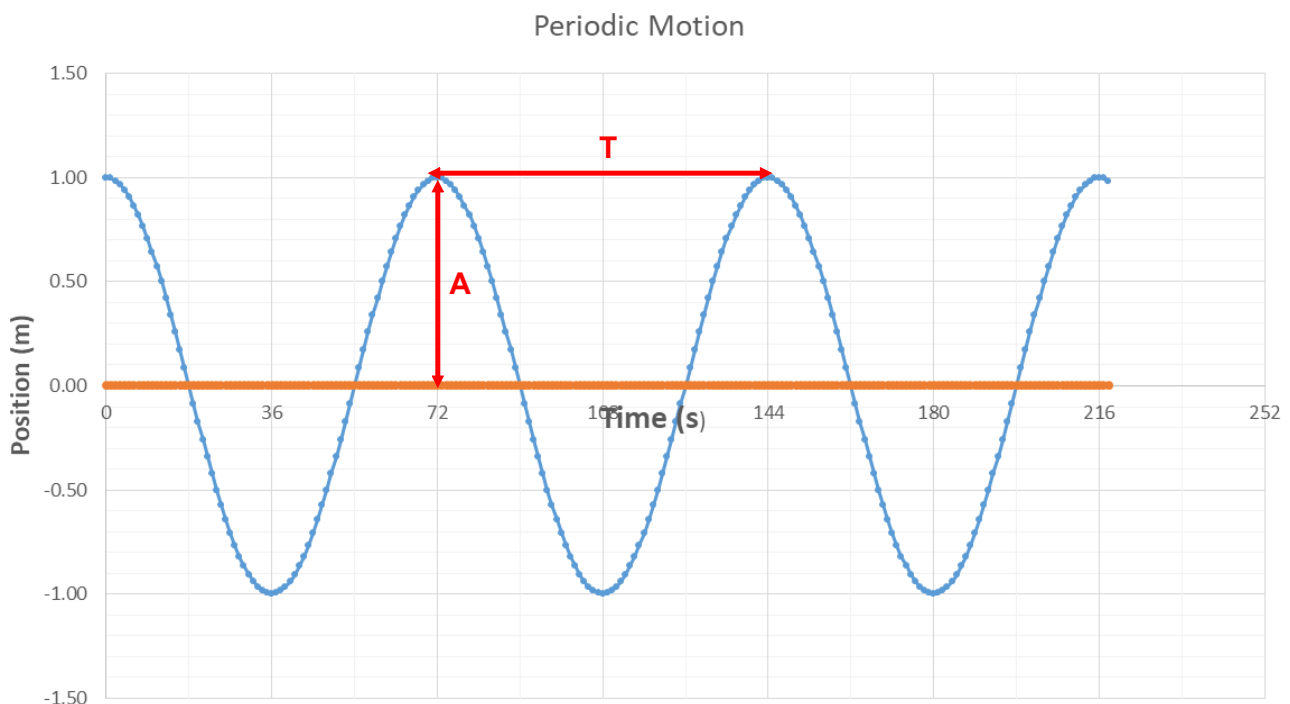
Characteristics of a Periodic Motion

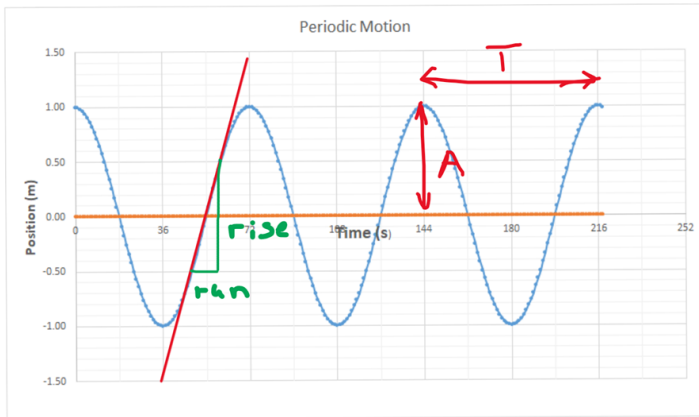
Amplitude - A - the distance between the x-axis and the peak of the periodic function (usually be measured in metres (m))

Period- T - the time for one complete cycle (usually measured in seconds)

Frequency - f - the number of cycles per unit time - mathematically it is the inverse of the period (if the period is in seconds, the frequency is in units per second or s^{-1} which equals a hertz (Hz))

Instantaneous Velocity - v - the velocity of the object at a point in time. This velocity will change in a regular pattern from a maximum in one direction to zero to a maximum in the opposite direction and then repeat.





A. Find Amplitude, Period and Frequency

$$A = 1.0 \text{ m}$$

$$T = 72 \text{ s}$$

$$f = \frac{1}{T} = \frac{1}{72 \text{ s}}$$

$$= 0.014 \text{ Hz}$$

$$(\text{s}^{-1})$$

B. Find instantaneous velocity at $t = 72 \text{ s}$ and $t = 54 \text{ s}$

$$v_{\text{inst}} = \text{slope}$$

$$\text{at } t = 72 \text{ s}, v_{\text{inst}} = 0 \text{ m/s}$$

$$\text{at } t = 54 \text{ s}, v_{\text{inst}} = \frac{1.0 \text{ m}}{12 \text{ s}} = 0.083 \text{ m/s}$$