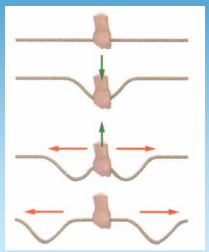
Types of Waves

1) Mechanical Wave - waves that travel through a medium and obey Newton's Laws of Motion.
2) Electromagnetic Waves - no medium is required to transmit these waves.
3) Matter Waves - Particles which show wave-like behavior (ex. electrons)

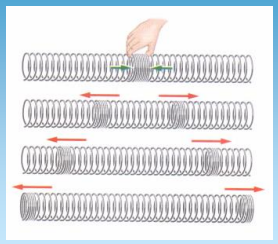
Mechanical Waves

- There are 3 types of mechanical waves:
- 1) Transverse - particles of medium vibrate perpendicularly to the motion of the wave. (guitar strings)



Mechanical Waves

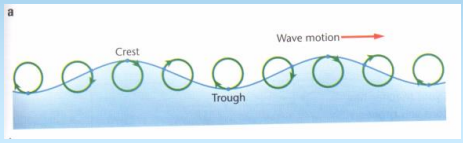
- 2) Longitudinal - particles of medium move parallel to the direction of the wave. (sound waves)



Mechanical Waves

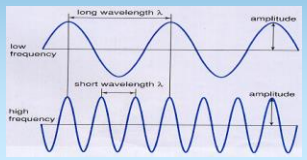
3) Surface - particles move both parallel and perpendicular (water waves)

- A wave pulse is a single disturbance on a wave. It produces a traveling wave which moves away from the source in the medium.



Wave Properties

1) Amplitude (A) - maximum distance from the equilibrium position to the crest or trough (m)
2) Wavelength (λ)- A crest and trough of a wave (m)
3) Frequency (f) - how fast the wave oscillates up and down per second. (Hz)



Wave Properties

4) Period (T) - time necessary to return to original point: $T = 1/f$
5) Speed (v) - varies depending on the type of wave and the medium that the wave travels through (m/s).
6) Energy (E) - amount of work done by the wave (J)

From these properties, we can determine the wavelength and the frequency using the equation:

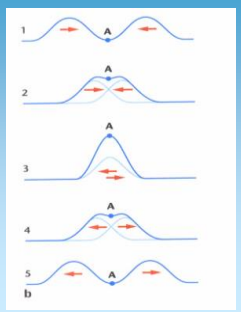
$$v = \lambda f$$

Superposition of Waves

Waves can exist at the same time and same place in a medium. This results in an interference of the waves. There are two types of interference:

1) constructive - waves add on to each other.

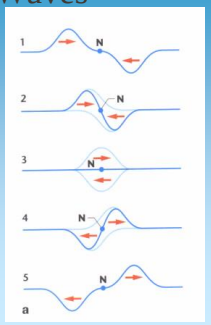
Node - point where medium remains undisturbed



Superposition of Waves

2) destructive - waves cancel each other out.

Antinode - maximum displacement from resting line



Standing Waves

Waves that are superimposed on one another but appear to be stationary.

Due to the reflection of the wave from the barrier, the waves add on to one another so that they resonate.

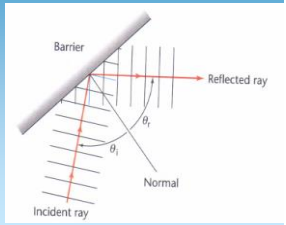
As a result, more nodes and antinodes are produced.

Speed of Waves through Different Mediums

- The speed of a wave does not depend on the properties of the wave, but on the properties of the medium.
- It is possible to change the speed of the wave through a medium by changing the medium itself.
- When a wave reaches a medium boundary (light going from air to water), two things can happen. Most of the wave is reflected, and some penetrates. As a result, the amount of energy changes. The wave loses energy as it travels past a medium boundary.
- A wave traveling into a more dense medium will reflect back from the boundary inverted. When the medium is less dense, the wave will remain in the same direction.

Law of Reflection of Waves

- Waves that bounce off a barrier always leave the barrier at an angle equal to which it comes in, or
- The angle of incidence is equal to the angle of reflection.
- The angle measurement are based off of the normal of the barrier.



Refraction

- A wave that passes into a new medium will change direction, or bend upon entering that new medium. The bend is due to the change in speed because of the new medium

Diffraction

- Waves that encounter a barrier with a hole in it will bend around the barrier, to produce waves behind the barrier.
- When the barrier has two holes, the waves can interfere and superimpose on one another, creating nodes and antinodes.