



Understanding WAVES

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What is a wave?

WAVE - a vibration or disturbance in space.



What is a wave?

- Waves *transfer energy* without transferring matter.



How are waves classified?

Waves are classified by **WHAT** they move through or by **HOW** particles move through them.



What material do waves move through?

MEDIUM- the substance that waves travel through and need to have in order to move.



Classification of Waves

According to what they move through
(Medium)

- Electromagnetic waves
- Mechanical Waves

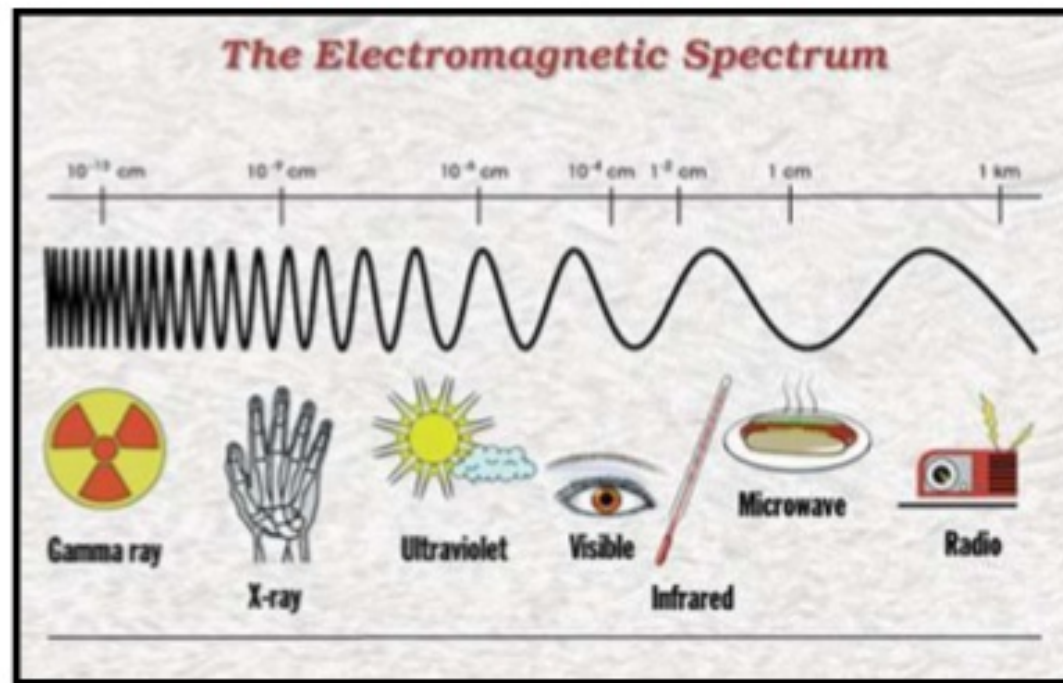


Types of Electromagnetic Waves

- radio waves
- microwaves
- infrared waves
 - visible light
- ultraviolet rays
 - X-rays

Electromagnetic Waves

Waves that can travel through matter or empty space where matter is not present.



Mechanical Waves



- Needs a medium
- require the particles of the medium to vibrate in order for energy to be transferred.

Types of Mechanical Waves

- water waves
- earthquake/seismic waves
- sound waves
- waves that travel down a rope or spring

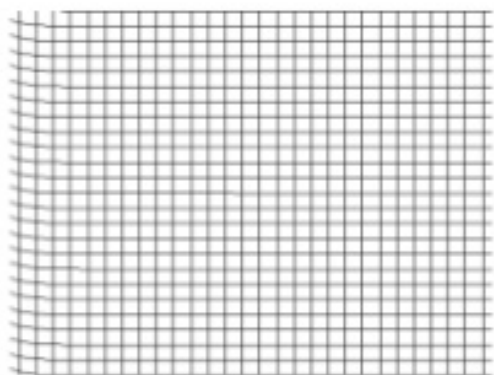
Classification of Waves

According to how particles move through them

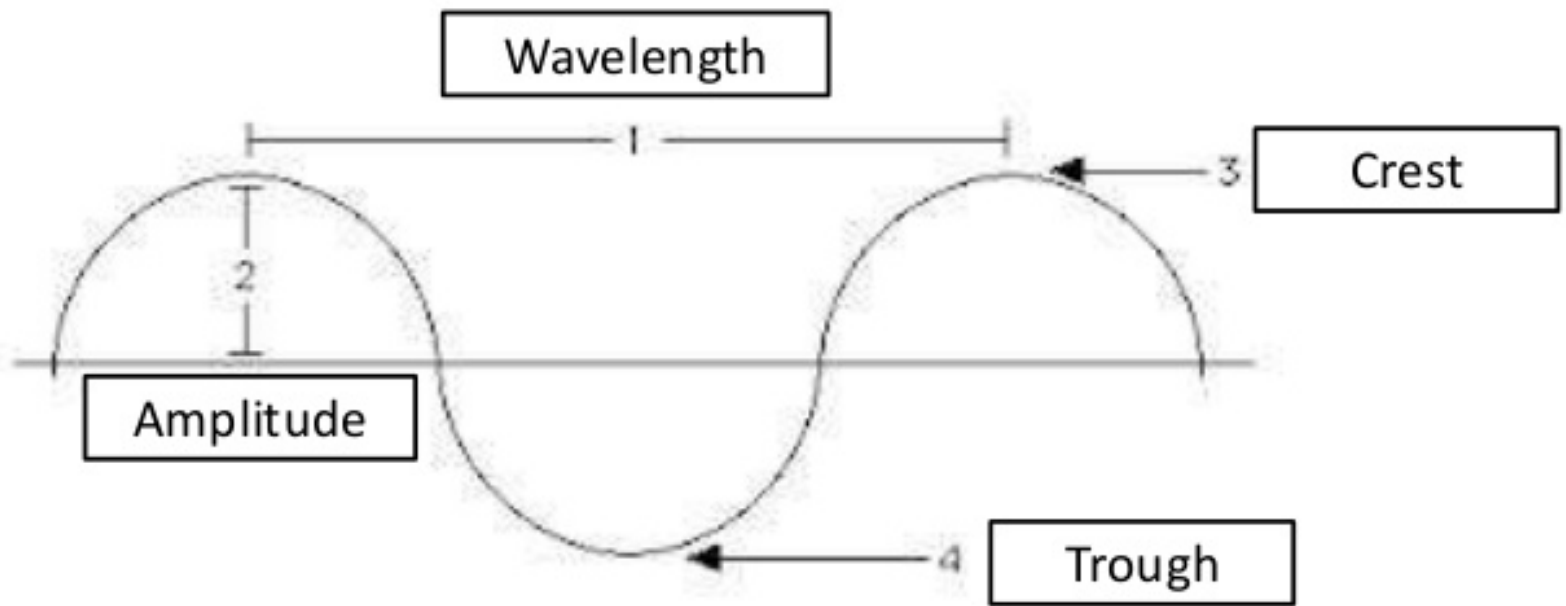
- Transverse waves
- Longitudinal Waves



Transverse Waves



Particles move
perpendicular to
the motion of the
wave



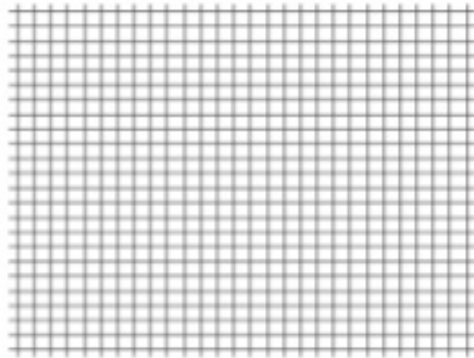
Wavelength (λ)

The *distance* from crest to crest
(or trough to trough); expressed
in meters

Amplitude (A)

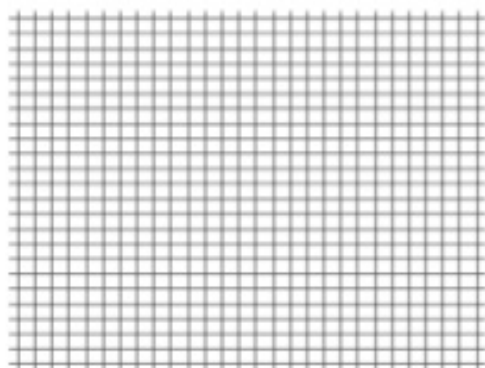
The distance of crest (or trough) from the *midpoint* of the wave

Longitudinal Waves



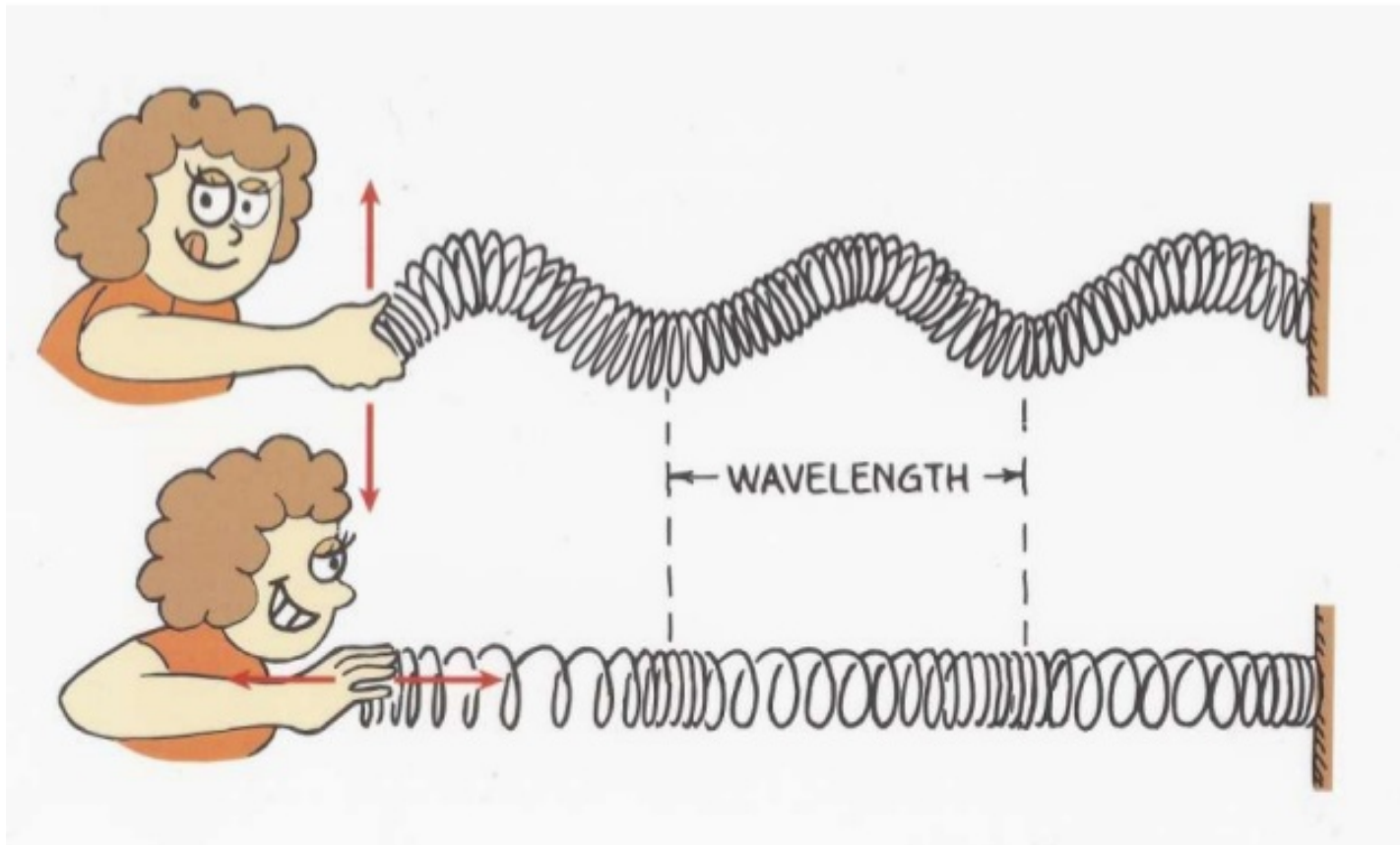
particles move
parallel to the
motion of the wave.

Longitudinal Waves



Compression- a crowded area causing a high-pressure region

Rarefaction- a spread out area causing a low-pressure region



Wave Characteristics

Frequency (f)

The number of waves that passed a fixed point per second

Unit: *hertz (Hz)*

$$f = 1/T$$

Wave Characteristics

Period (T)

The time it takes a wave to travel a distance equal to a wavelength;

Unit: seconds

$$T = 1/f$$

Wave Characteristics

Wave velocity (v)

Distance travelled by a wave crest in one period.

Unit: m/s

$$v = \lambda / T$$

Wave Behaviour

What happens when...

- A wave meets a hard surface like a wall?
- A wave enters a new medium?
- A wave moves around an obstacle?
- A wave meets another wave?

Reflection



When a wave hits a surface through which it cannot pass, it bounces back.

Reflection



- Reflection does not change the speed or frequency of the wave, *BUT* the wave can be flipped upside down!

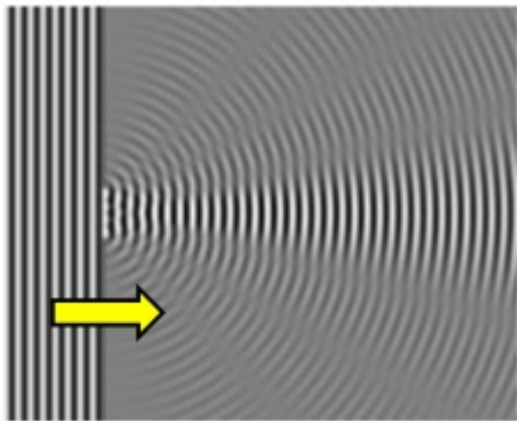
Refraction



The bending of a wave as it enters a new medium.

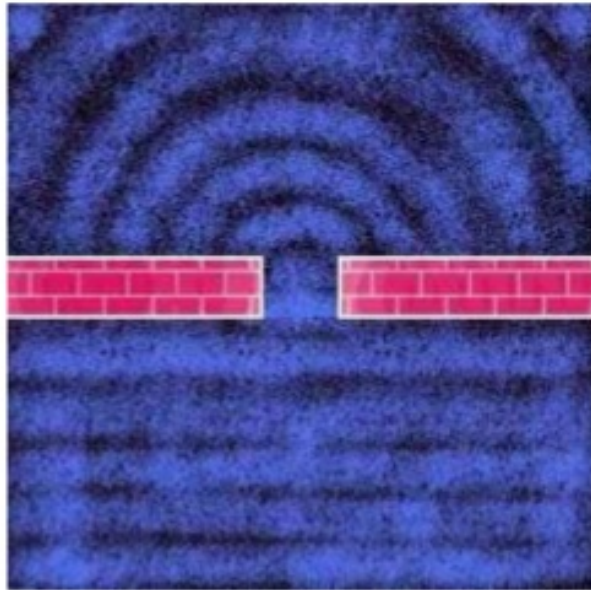
- It is caused by a change in the speed of the wave as it moves from one medium to another
- Greater change in speed = more bending of the wave

Diffraction



The bending of a wave as it moves around an obstacle or passes through a narrow opening.

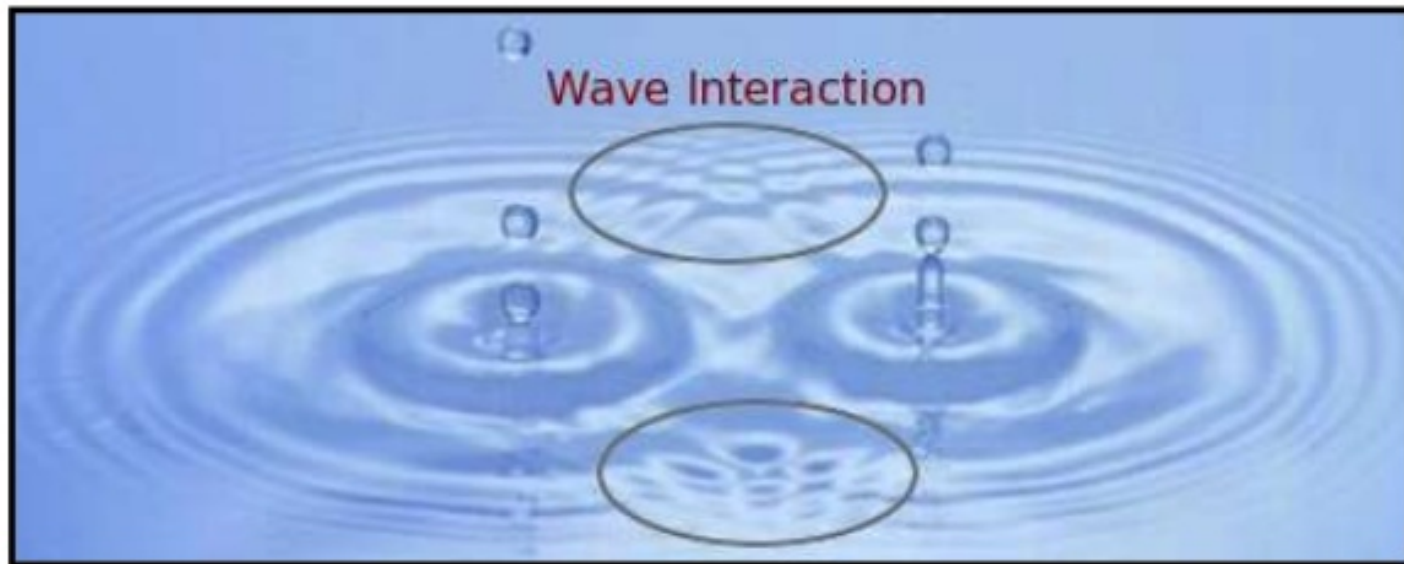
Diffraction



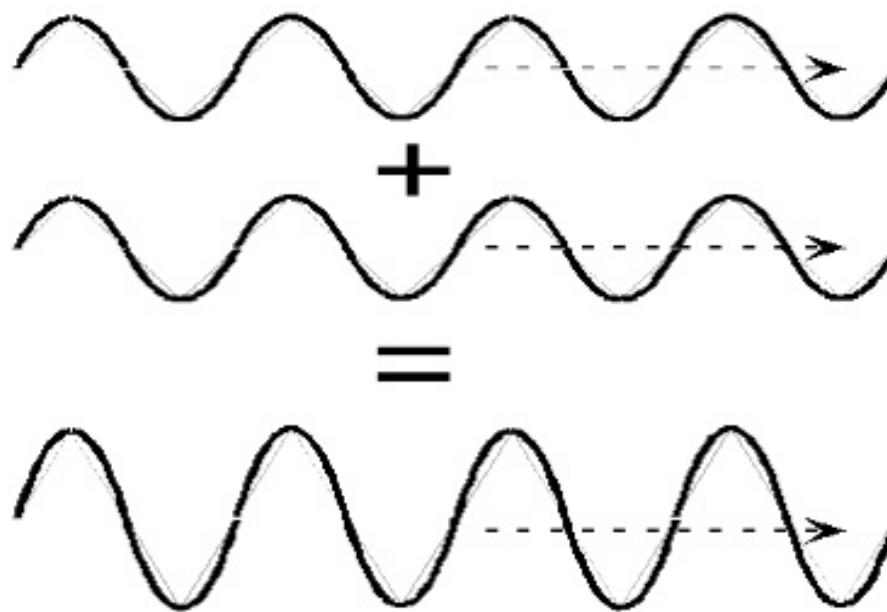
- The wave will try to curve around the boundary or outward through the opening due to friction.

Interference

When two or more waves
combine together.

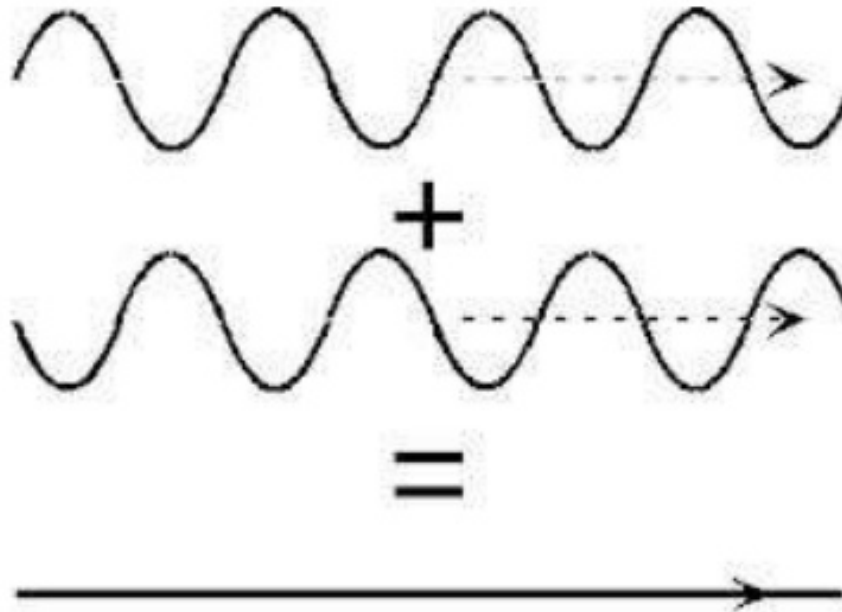


Constructive Interference



When two waves combine to make a larger wave.
(crest & crest) or (trough & trough)

Destructive Interference

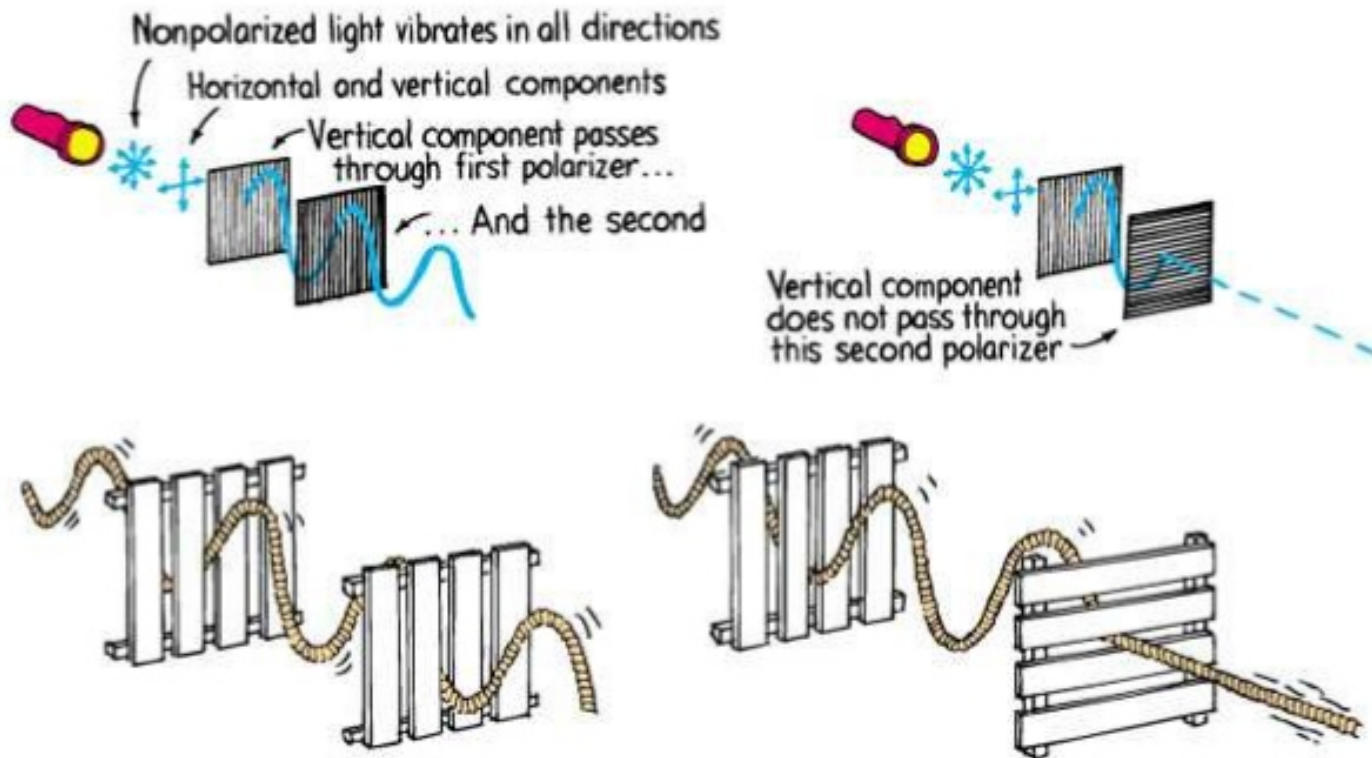


- Two or more waves combine to produce a smaller wave or destroy the wave completely. (crest & trough)

Polarization

Filtering radiating light (moves in all directions) to allow only light traveling in one direction through

Polarization

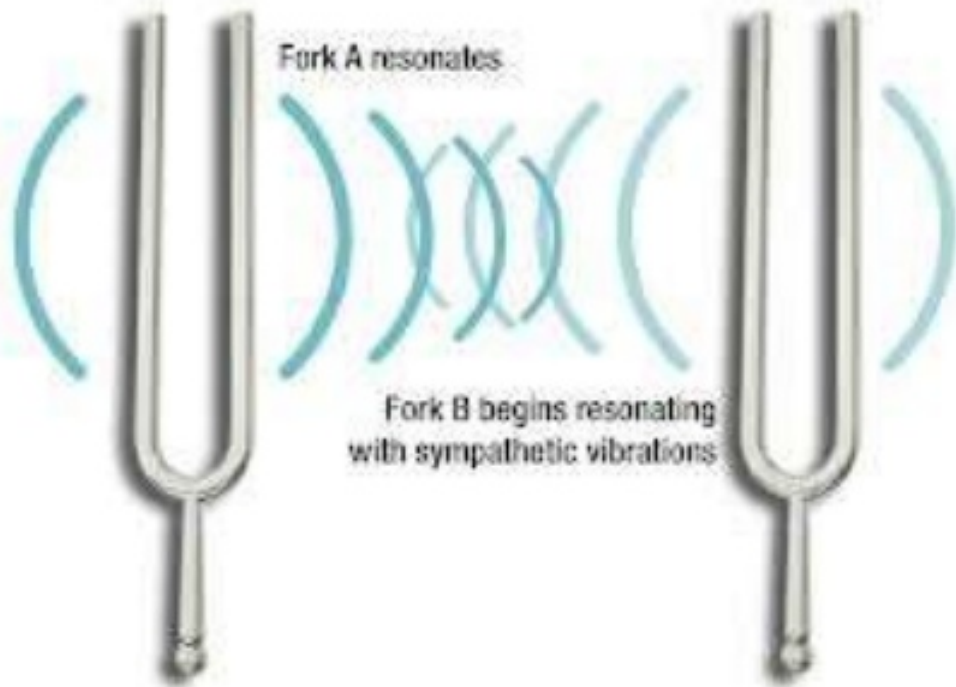


Resonance

When one object vibrates another
without touching

- The 2 objects resonate at the same frequency
- Amplitude increases

Resonance



Thank You