WAVE MOTION AND SOUND

WAVE MOTION (The first main wave type)

wave is an : oscillation accompanied by a transfer of energy.

- Frequency refers to the : addition of time.

Waves consist of :

- oscillations

Or

- vibrations
- around almost fixed locations.

Wave motion transfers energy from one point to another

MECHANICAL WAVES ✓ 3 types

mechanical wave :

- is a wave that is an oscillation of matter

therefore

- transfers energy through a medium.

waves can move over long distances but:

- the movement of the medium of transmission (the material) is limited.

Therefore:

- oscillating material : does not move far from its initial position

Mechanical waves transport energy in the same direction as the wave.

Mechanical waves can be produced only:

- in media which possess elasticity and inertia.

mechanical wave :

- requires an initial energy input.
- Once this energy is added, the wave travels through the medium until all its energy is transferred.

electromagnetic waves require no medium, but can still travel through one.

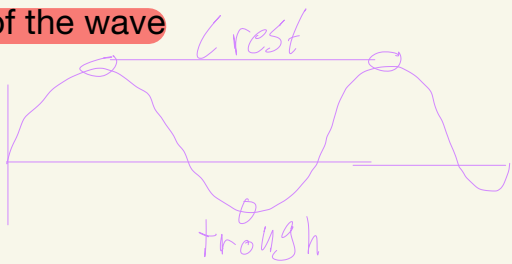
important property of mechanical waves is that :

- their amplitudes are measured in an unusual way by :
- displacement of the medium divided by its wavelength

Transverse Waves

Transverse waves cause the medium to :

- vibrate at a right angle to the direction of the wave



Transverse waves have two parts;

- the crest
- the trough

The crest is the: highest point of the wave
the trough is the: lowest point of the wave

Its wavelength is the distance from :

- crest to crest or from trough to trough.

example,

- move an end of a Slinky (whose other end is fixed) to the left-and-right
- Light also has properties of a transverse wave, although it is an electromagnetic wave

Longitudinal Waves
Longitudinal waves cause the medium to :

- vibrate parallel to the direction of the wave

Longitudinal Waves consists of multiple:

- compressions

and

- rarefactions

rarefaction is the: farthest distance apart in the longitudinal wave and the compression is the closest distance together.

The speed of the longitudinal wave is increased due to the:

- closer proximity of the atoms in the medium that is being compressed.

Sound is considered a: longitudinal wave longitudinal wave

Cm

Surface Waves

This type of wave travels along :

- a surface that is between two media.

There are two types of surface waves:

- Rayleigh waves
- Love waves.

1, Rayleigh waves: also known as ground roll

- are waves that travel as ripples similar to waves on the surface of water.

2, Love wave:

- is a surface waves having horizontal waves
- that are shear or transverse to the direction of movement.
- usually travel faster than Rayleigh waves and have the largest amplitude

ELECTROMAGNETIC WAVES (The second main wave type)

- electromagnetic waves, do not require a medium

Instead
they consist of :

- periodic oscillations of electrical

and

- magnetic fields which are generated by charged particles, and can therefore travel through a vacuum.

These wave types include:
radio waves
microwaves
infrared radiation
visible light
ultraviolet radiation
X-rays
gamma rays.

electromechanical wave can be
1, transverse.
where a :

- disturbance creates oscillations that are perpendicular to the propagation of energy transfer.

2, longitudinal :
where the :

- oscillations are parallel to the direction of energy propagation.

3, mechanical wave:
While mechanical waves can be:

- both transverse and longitudinal, all electromagnetic waves are transverse in free space.

SINUSOIDAL WAVE MOTION
sine wave or sinusoid is a:

- mathematical curve that describes a smooth repetitive oscillation
- sine wave is a continuous wave.

sine wave is important in physics because it :

- retains its wave shape when added to another sine wave of the same frequency.
- is the only periodic waveform that has this property.

human ear can recognize single sine waves as sounding clear
because :

- sine waves are representations of a single frequency without harmonics.

INTERFERENCE PHENOMENA

Wave interference is the effect of:

- combining two or more waves moving on intersecting paths.

The effect is of :

- combining the amplitudes of each individual waves

If both waves are of the same frequency and phase :

- they move at the same rate

the amplitudes are :

- reinforced, producing constructive interference.

However;

if the two waves are out of phase:

- the result is destructive, producing complete annulment

example, if two stones are dropped in a pool of water, waves spread out from each source, and interference occurs where they combine.

Constructive interference results where :

- the crest of one coincides with the crest of the other

Interference also occurs between :

- two waves moving in the same direction but having different wavelengths or frequencies.

The effect is a : complex wave

pulsating frequency called a :

- beat results
- when the wavelengths are slightly different.

standing waves:

- Interference between waves traveling in opposite directions produce standing waves

Destructive: Cancel Each other

STANDING WAVES

standing wave (or stationary wave) is a :

- wave in which its peaks do not move spatially

The amplitude of the wave at a : point in space may vary
but its phase : remains constant.

nodes

- The locations at which the amplitude is smallest are called nodes

antinodes

- the locations where the amplitude is greatest are called antinodes.

Standing waves were first noticed on the surface of a liquid in a vibrating container

It occurs because :

- the medium is moving in the opposite direction to the wave
- or as a result of interference between two waves traveling in opposite directions.

The most common cause of standing waves is : resonance in which: standing waves occur due to interference between waves reflected back and forth at the same frequency.

For waves of equal amplitude traveling in opposing directions, there is:

- no net propagation of energy.

SOUND

Sound has been defined as a series of:

- disturbances in matter that the human ear can detect

(This definition can also be applied to disturbances which are beyond the range of human hearing)

There are three elements which are necessary for the transmission and reception of sound:

- the source. (Anything which moves back and forth (vibrates) and disturbs the medium around it may be considered a sound source.)
- medium for carrying the sound,
- the detector

SOUND WAVES

Sound waves are:

- mechanical waves since sound is a wave motion in matter.

It can best be understood by first considering water waves.

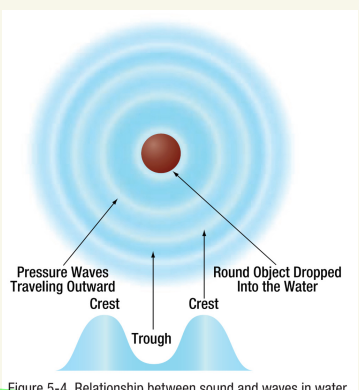


Figure 5-4. Relationship between sound and waves in water.

Sound travels through matter in the form of : longitudinal wave motions.

These waves are called longitudinal waves because the:

- particles of the medium vibrate back and forth longitudinally in the direction of propagation.

mach number:

sub-sonic: less than mach 1

sonic: speed of sound 340 m/s

super sonic: more than mach 1

Dissible: How to measure sound

when sound increas: amplitued increas

pitch: high-pitch = high-freqaency

Doppler Effect: The closser the sound the louded it is

mach number: ratio of speed of the AC to the speed of sound mach no: $\frac{\text{AC speed}}{\text{speed of sound}} = 340\ m/s$

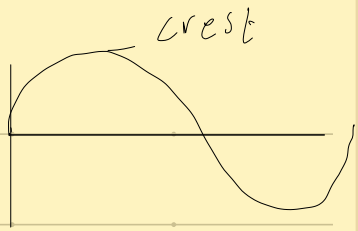
Mechanical waves:

1. Longitudinal -> Parallel Ex: Sound

2. Transvers -> Perpendecular 90° Ex: Sound

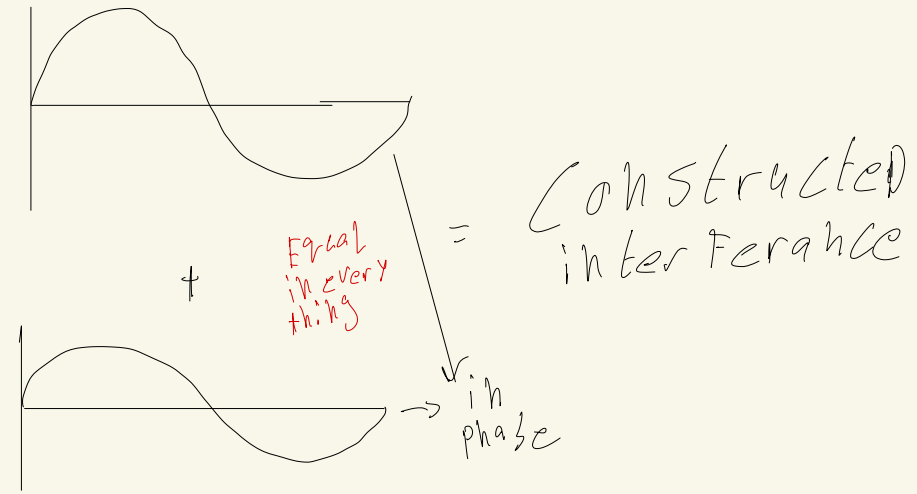
3. Surface -> Relight -> water ripple
   Love -> Light

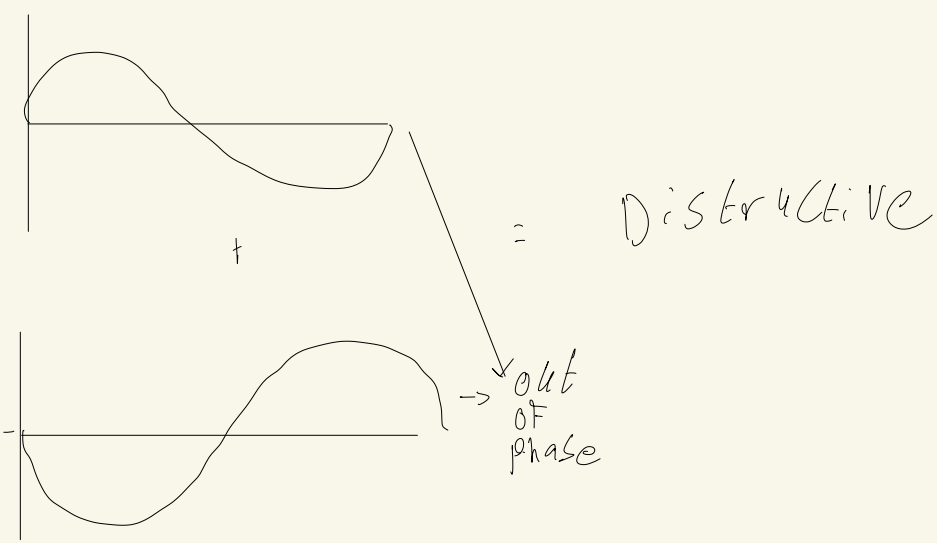
Transver:



Electromagnitic waves:

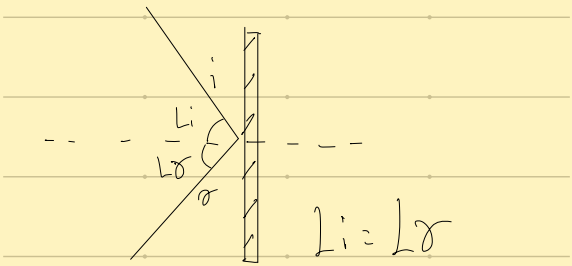
* Dont heed a Mediam (x-ray, microwave)





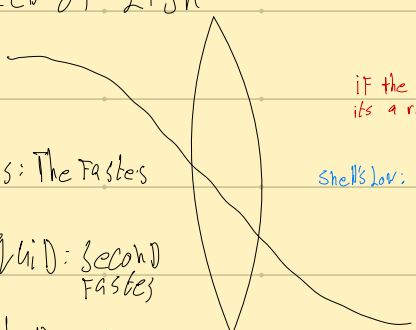
speed of light: 3×10^8

reflection: mirror



refraction: The light change Direction

speed of light



if the light bend its a refraction

Snell's law: $\frac{n_1}{n_2} = \frac{\sin\theta_2}{\sin\theta_1}$

gas: The fastes

Liquid: second Fastes

Solid: Slowest

Mirror:

1. Plain 

2. Concave 

3. Convex : car mirror
magnify something

Lance

1. Plain

2. Concave

3. Convex