

Different Types of Waves & their Properties

► WAVE

• A wave is a disturbance, which propagates energy from one place to the other without the transportation of matter.

Types of Waves:

- Mechanical wave (longitudinal wave and transverse wave)
- Electromagnetic wave

1. Mechanical Wave

Longitudinal Waves

- In this wave, the particles of the medium vibrate in the direction of propagation of the wave.
- Waves on springs or sound waves in air are examples of longitudinal waves.

Transverse Waves

- In this wave, the particles of the medium vibrate perpendicular to the direction of propagation of the wave.
- Waves on strings under tension, waves on the surface of the water are the examples of transverse waves.

2. Electromagnetic Waves

- The waves, which do not require a medium for their propagation i.e., which can propagate even through the vacuum are called electromagnetic waves.
- These waves propagate with the velocity of light in vacuum.
- Following are the electromagnetic (Non-mechanical) waves-

1. Gamma rays (**Highest frequency**)

2. X-rays

3. UV rays

4. Visible radiation
5. Infra-red rays
6. Short radio waves
7. Long radio waves (**Lowest frequency**)

All are in decreasing order of the frequency.

• Following waves are not categorized as electromagnetic.

1. Cathode rays
2. Canal rays
3. Alpha rays
4. Beta rays
5. Sound waves
6. Ultrasonic wave

3. Sound Waves

• Sound waves are longitudinal mechanical waves. Based on their frequency range sound waves are divided into following categories.

(a) The sound waves which lie in the frequency range **20 Hz to 20000 Hz** are called audible waves.

(b) The sound waves having frequencies less than **20 Hz** are called **infrasonic**

(c) The sound waves having frequencies greater than **20000 Hz** are called **ultrasonic** waves. Ultrasonic waves are used for sending signals, measuring the depth of sea, cleaning clothes and machinery parts, remaining lamp short from the chimney of factories and in ultrasonography.

► Speed of Sound

• The speed of sound is **maximum in solids minimum in gases**.

• When the sound goes from one medium to another medium, its speed and wavelength changes, but frequency remains unchanged. The speed of sound remains unchanged by the increase or decrease of pressure.

• The speed of sound increases with the increase of temperature of the medium.

- The speed of sound is more in humid air than in dry air because the density of humid air is less than the density of dry air.

► **Echo**

- The repetition of sound due to the reflection of sound waves is called an **echo**.

► **Intensity**

- It is defined as the amount of energy passing normally per unit area held around that point per source unit time.

► **Pitch**

- The sensation of a frequency is commonly referred to as the pitch of a sound.

► **Sonar**

- It stands for sound navigation and ranging. It is used to measure the depth of a sea, to locate the enemy submarines and shipwrecks.

► **Doppler's Effect**

If there is a relative motion between the source of sound and observer, the apparent frequency of the sound heard by the observer is different from the actual frequency of sound emitted by the source. this phenomenon is called **Doppler's Effect**.