**WAVE MOTION**

A wave is the disturbance produce in the medium from an equilibrium condition which travels with the finite velocity in the region of space. Wave motion transfers energy from one point to another, which may or may not displace particles of the medium.

**Characteristics of wave motion**

a. Particles vibrate about their mean position when disturbance is produced in medium

b. There is transference of energy to the nearest particle as disturbance occurs, which depends on the nature of the medium.

c. Total displacement of the particle resultant over the one period is zero.

d. Consecutive particles have certain phase difference as vibration occurs.

e. Vibrating particle   posses both kinetic and potential energy.

f. Wave velocity and particle velocity of the medium are different.

The wave motion is divided in to two categories.

They are: **Transverse wave motion**

**Longitudinal wave motion**

**Transverse wave motion**

If the particles of the medium vibrate perpendicular to the direction of the propagation of the wave, then the wave motion is called transverse wave motion. These waves can propagate through solids and liquids but not through gases, because gases do not possess elastic properties. Examples of these waves are: vibrations in strings, ripples on water surface and electromagnetic waves.

**Properties of transverse wave**

1. The particles of medium vibrate perpendicularly to the direction of the propagation of wave.

2. The velocity of each particle is maximum at mean position and zero at extreme position.

3 .All the particles in the medium has same amplitude, frequency and time period.

4. Different particles in the medium have different displacement at any instant of time.

**Longitudinal wave motion**

If the particles of the medium vibrate to the direction of the propagation of the wave, then the wave motion is called longitudinal wave motion. Examples: sound wave Longitudinal waves travel through the medium with the compression and rarefaction. The compression is the region where volume decreases and consequent increase in density and pressure of the medium and in rarefaction there is increase in volume with consequent decrease in density and pressure. Due to the variation in pressure at different region in the medium longitudinal waves are called pressure waves.

**Properties of Longitudinal wave**

1. The particles of the medium vibrate to the direction of the propagation of the wave.

2. The velocity of each particle is maximum at mean position and zero at extreme position.

3 All the particles in the medium have same amplitude, frequency and time period.

4. All the particles in phase are at distance equal to nλ where n=1, 2, 3 and λ is the wavelength

**Superposition of waves**

It states that “when two or more than two progressive waves travel in a medium through any point at the same time the net displacement at that point is equal to the vector sum of the individual displacements of the waves at that point”.

The principle of superposition of waves can be explained as:

a. When two waves having same frequency travelling in the same direction meet each other, constructive interference is formed.

b. If there are number of waves, they travel independently and characteristics of the wave remain unchanged.

c. The  resultant intensity at any point in the medium is not equal to sum of intensity of the  two waves .In constructive interference , the total intensity is greater than sum of intensities of individual waves whereas  in destructive  interference the total intensities is less than the sum of individual intensities.

d. Beats are formed when two waves differing in frequency are superimposed.

**Interference of waves**

Interference is the superposition of two waves of the same frequency  travelling in the same direction.