(3) Terminology of Wave Motion

(i) Time Period (T):

This is the time that takers by a Partical to Complete one vibration, if the frequency is n. then, $T = 1/n$ or time Period = 1/frequency.

(ii) Wavelength (λ):

The distance between two Consecutive Peaks or Throughs of a Wave is called Wavelength.

(iii) Amplitude (A):

The amplitude of the Wave is the maximum displacement of a Partide of the Medium from its equilibrium Position.

(iv) Velocity (V):

Whenever the Source (of the disturbance) vibrates once, the wave is Carried forward for Some distance λ. If 'n' vibrations take Place in one Second, then the Wave travels 'n' distance '$n\lambda$'. The distance Covered by the Wave in one Second is the velocity V of the Wave.

Then $V = n\lambda$ —— (1)

where, $n = 1/T$ —— (2)

(V) Intensity (I):

The energy transferred by a wave in unit time, perpendicular to the direction of its propagation from the unit area, is known as wave intensity. The intensity of a wave is proportional to the square of the wave's amplitude.

Thus, $I \propto |A|^2$ — (3)

(V) Phase Angle (ϕ):

The displacement of particles in the medium and the direction of their displacement varies from point to point along with the wave. The quantity which represents the displacement is called the phase of vibration ϕ.

Phase can be expressed as degrees or radians; or as the ratio of time t to time period T; or as the ratio of distance x to wavelength λ. The ratio t/T and x/λ is the functional number and has a maximum value of 1. When expressed in terms of radians (or degrees), the maximum value a step can have is 2π radians (or 360°)

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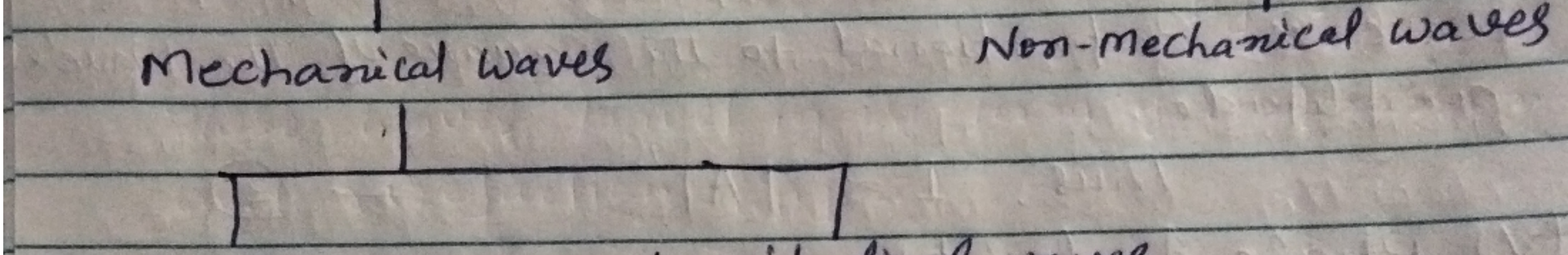
Types of Wave Motion.

There are two types of wave motion which are as follows:



(1) Mechanical Waves:

The mechanical waves are those waves which can be produced or propagated only in material medium. For example, Sound waves, Water waves and Seismic waves etc. The mechanical waves are of two types such as:

(i) Transverse Wave Motion:

A wave in which the particles of the medium vibrate at right angles to the direction of propagation of the wave is called a transverse wave. A transverse wave is a wave in which the particles of the medium are displaced in a direction perpendicular to the direction of energy transport. These waves travel in the form of peaks and troughs.

Fig. (4)

a) The Crest is the highest Point at which the medium rises.

b) The tough is the lowest Point at which the medium sinks.

Some examples of transverse waves are:

(a) Waves on the Surface of the water.

(b) Waves on the wire.

Properties of Transverse waves:

(a) the distance between two Consecutive Crests or troughts is called wavelength of the transverse waves. It is denoted by λ.

(b) Medium requires elasticity of shape. i.e. rigidity Modulus.

(c) It can be transmitted only Through Solids and Surface of the liquids.

(d) It can be Polarised.

(ii) Longitudinal wave motion:

A wave in which the Particles of the Medium vibrate in the same direction in which the wave is Propagating is called a longitudinal wave.

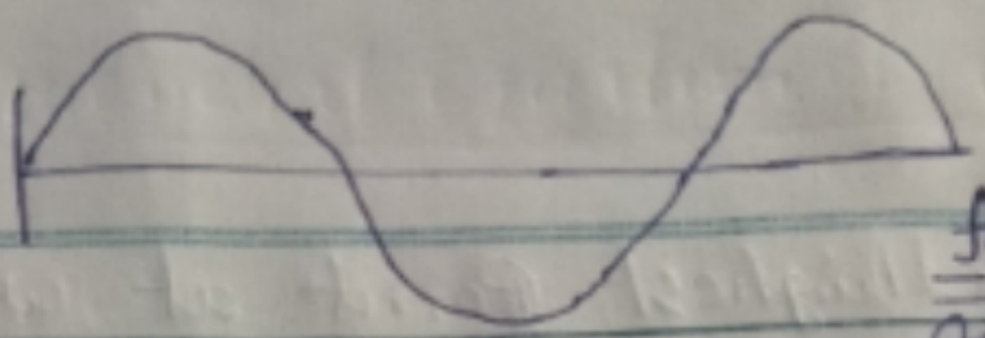
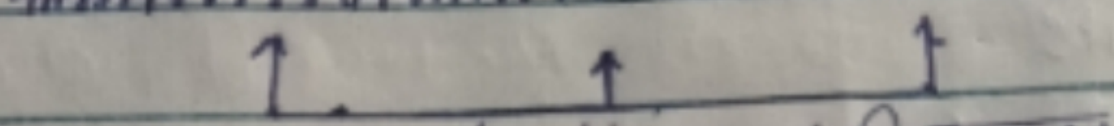


fig - 4

Compressions (सम्पीडन)



Rarefactions (विरलन)

fig - 5

These waves travel in the form of Compression and rarefaction (fig-5)

a) Compression :

It is a region in a longitudinal wave where the Particles are closest together.

b) Rarefaction :

This is the region of the longitudinal wave where the Particles are farthest.

Some examples of longitudinal waves are -

(a) Sound waves in air.

(b) The vibration in a spring

(c) The fluctuations in a gas

Properties of Longitudinal waves :

a) The distance between two Consecutive Compressions or rarefactions is Wavelength of the longitudinal waves.

b) Medium requires elasticity of Volume, i.e. bulk modulus.

c) It can be transmitted Through Solids, liquids and gases.

d) It can not be Polarised.

VKSU (2.) Non-mechanical Waves:

The non-mechanical waves are Those waves which can be independent of Propagation medium. For example, visible light. ultraviolet light, X-rays etc.

Difference between Longitudinal and Transverse Wave:

The difference between Longitudinal & Transverse wave are discussed in the table:

Longitudinal:

(1) The movement of the medium is of the same direction of the wave
(2) It acts in one dimension.
(3) The wave cannot be Polarized or aligned.
(4) This Wave can be Produced in any medium such as gas, liquid or Solid.

Transverse:

(1) The movement of the medium is Perpendicular to the direction of wave.
(2) It acts in two dimension.
(3) The Wave can be Polarized or aligned.
(4) This Wave can be Produced in Solid and liquid's surface.