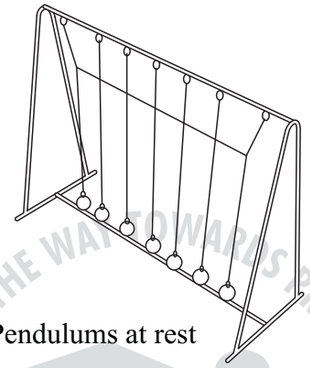
WAVE MOTION WITH PENDULUMS

Formation of waves, Transverse waves and longitudinal waves.

Assembly :

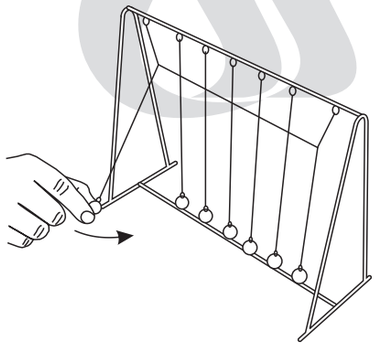
Consists of seven pendulums of equal length and of equal mass. These pendulums are suspended to the hooks which are fixed to a metal frame. Also the pendulums are interconnected by a string at the tap in horizontal direction.



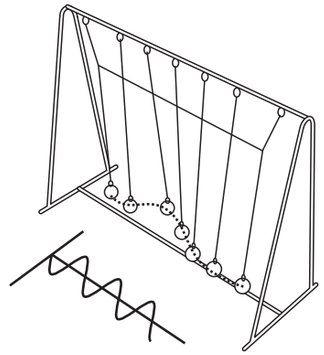
Pendulums at rest

To do and observe

Wave motion & Transverse wave

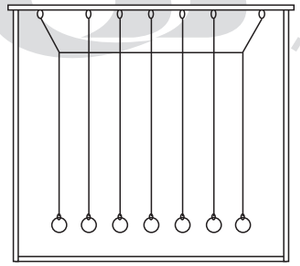


When the first Pendulum is pulled
(perpendicular to the plane of the pendulums)

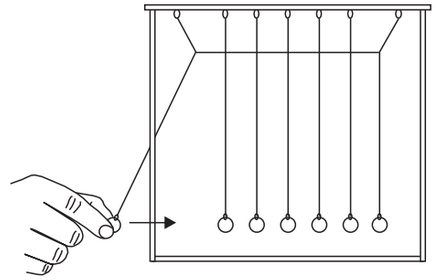


Observe how the disturbance is transferred from one pendulum to another.
Also observe the direction of motion of pendulums with respect to the propagation of the disturbance

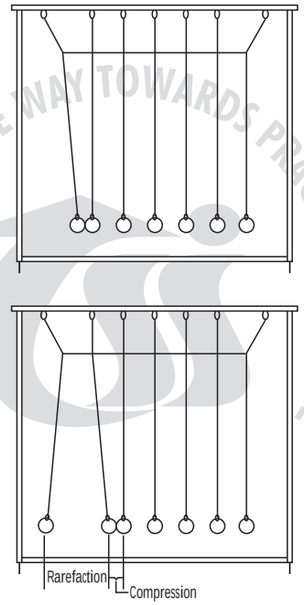
Longitudinal wave



Pendulums at rest



When the first Pendulum is pulled
(parallel to the plane of the pendulums)



Observe the direction of motion of pendulums with respect to the propagation of the disturbance

What is going on?

When you pull the first pendulum towards you and let go, it starts oscillating periodically about its mean position. The plane of oscillation is perpendicular to plane of all pendulums. This pendulum transfers its vibrational energy to the second one, as they are inter connected by means of thread. Therefore 2nd pendulum starts oscillating after some time. Now the 2nd one will transfer it vibrational energy to the 3rd. Therefore 3rd one also starts vibrating after some time. In this way each pendulum transfers its vibrational energy to the neighboring pendulum, there by causing wave motion. Here you can clearly notice that all the pendulums do not vibrate simultaneously. There is phase difference in successive vibrations.

If you observe motion of each pendulum, they will be vibrating periodically about their mean position and perpendicular to the direction of motion of distance. This type of wave motion is called as transverse waves. You will notice that the wave moves with alternate crest and trough.

Finally when you pull the 1st pendulum away from the frame in the same plane and let go. Now also disturbance created at the first pendulum moves to 2nd, 2nd to 3rd and so on. But now the pendulums vibrate periodically about their mean position along the direction of propogation of disturbance. This type of wave motion is called longitudinal waves. In this process when two pendulums come closer, form compression, when they move away form rarefaction and between every two compressions there is one rarefaction and vice-versa.

Lord Rayleigh

TARANG SCIENTIFIC INSTRUMENTS

THE WAY TOWARDS PRACTICAL SCIENCE

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