LAKSHYA

MHTCET 2025

Physics

Lecture - 01

Superposition of Waves

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Topics

to be covered

1. Introduction ✓
2. Progressive Wave ✓
3. Reflection of Waves ✓
4. Superposition of Waves

1) Lecture

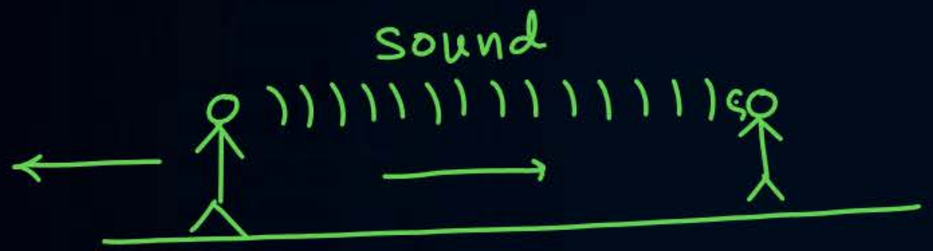
2) formulas

3) Numerical ⟶ soln

4) Practise.

Introduction

- **Wave** ⟶ Disturbance traveling through medium.



e.g Sound waves, Waves on water surface

Types of waves :

Mechanical Waves

- Requires medium to travel
- Sound waves

Non-Mechanical waves.

- Not required medium to travel.
- Electromagnetic waves.

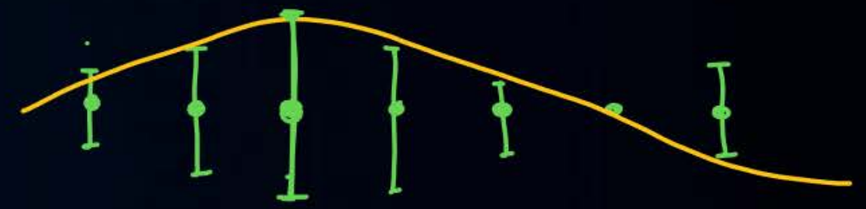
Progressive Wave

The wave in which disturbance created in the medium travel continously without obstruction or damping from one point to other is c/a Progressive wave.

Properties of progressive waves

1) Particle of medium performs SHM.

2) All particles have same amplitude period & frequency.



3) The phase changes from one particle to another

4) No particle of medium will be at rest permanently.

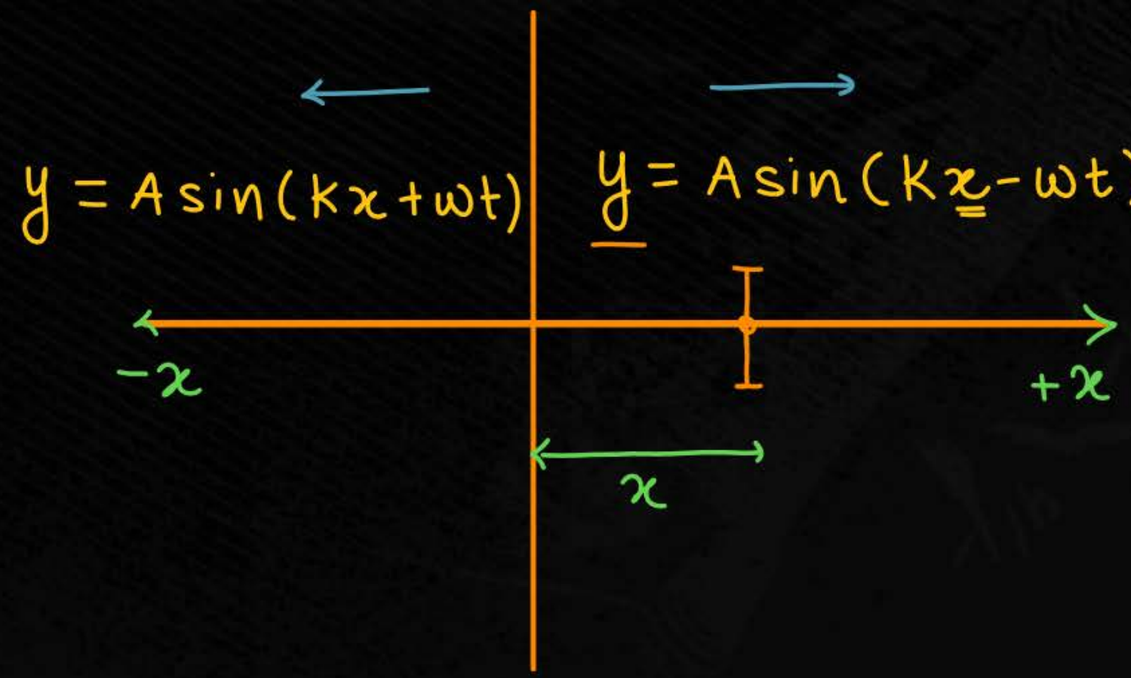
5) Energy transfer only not matter

6) Particle has maximum velocity at mean posn.

7) two types
- transverse → particle vibrates ⊥er to direction of wave.
- longitudinal. → particle vibrates ∥el to direction of waves.

8) only longitudinal wave pass through fluids
not transverse wave

9) Both waves can travel through solids.



$k = \frac{2\pi}{\lambda}$

Que:

$y = 5 \sin(x - 2\pi t)$

find λ and f.

$y = A \sin(Kx - \omega t)$

$A = 5$, $K = 1$, $\omega = 2\pi$

$K = \frac{2\pi}{\lambda}$ $\quad \therefore \lambda = 2\pi$

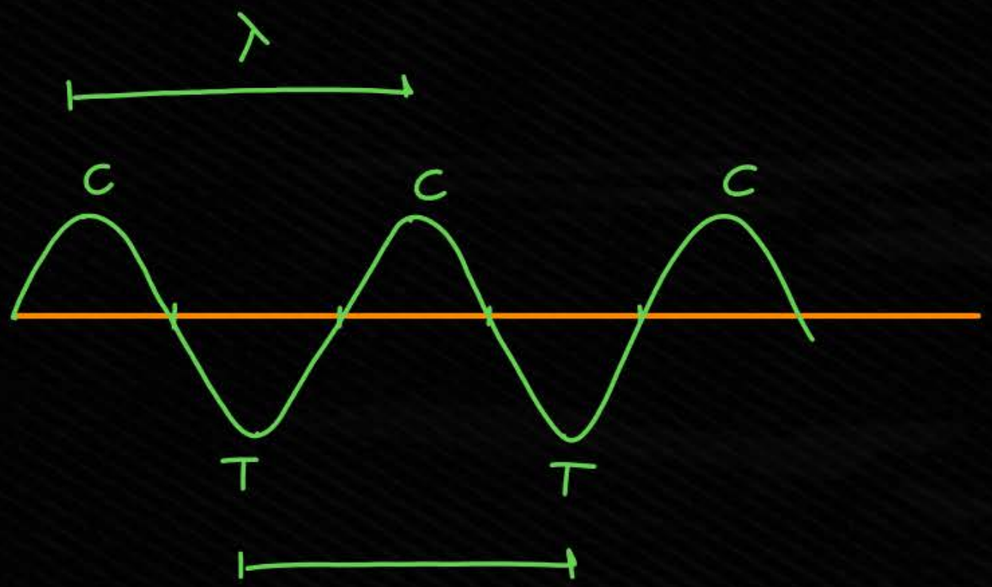
$\omega = 2\pi$

$2\pi f = 2\pi$

$f = 1\ Hz$.

✱ Note → Wave velocity

$$v = f\lambda$$



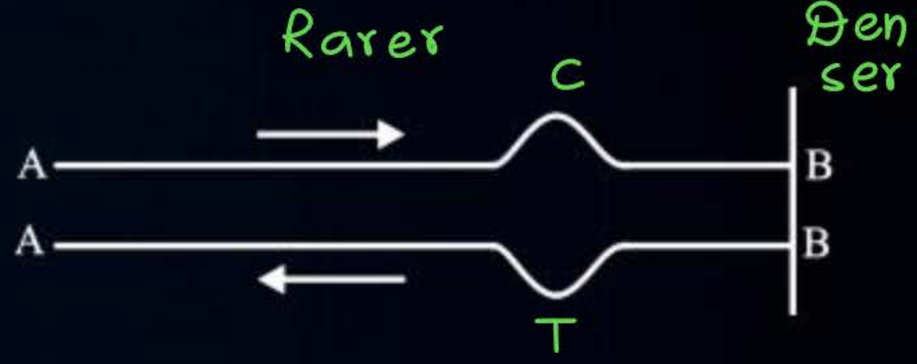
C – Crest

T – Trough.

Reflection of Waves

Reflection of a Transverse Wave :

- When transverse wave travels from rarer to denser medium then crest is reflected as through & vice-versa.
- When transverse wave travels from denser to rarer medium then

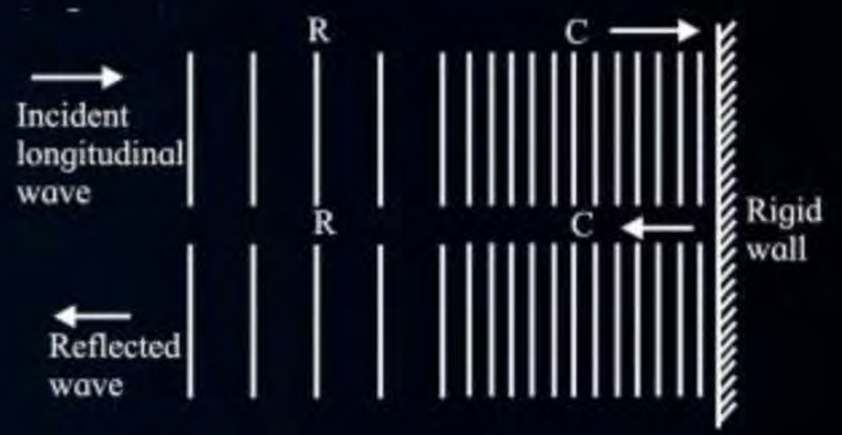


crest is Reflected as crest &

trough is reflected as trough.

Reflection of a Longitudinal Wave

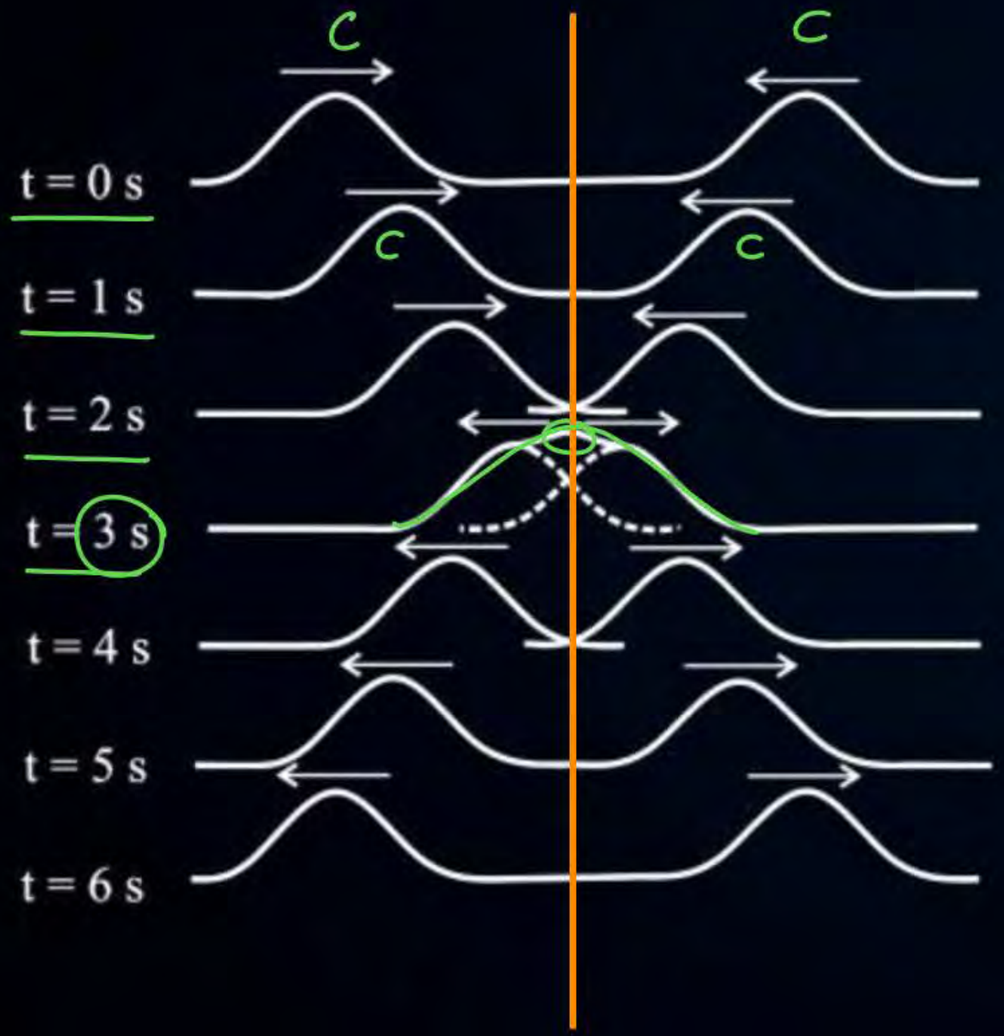
- when longitudinal waves travels from rarer to denser medium then compression is reflected as compression & rarefaction is reflected as rarefaction.
- Home work.

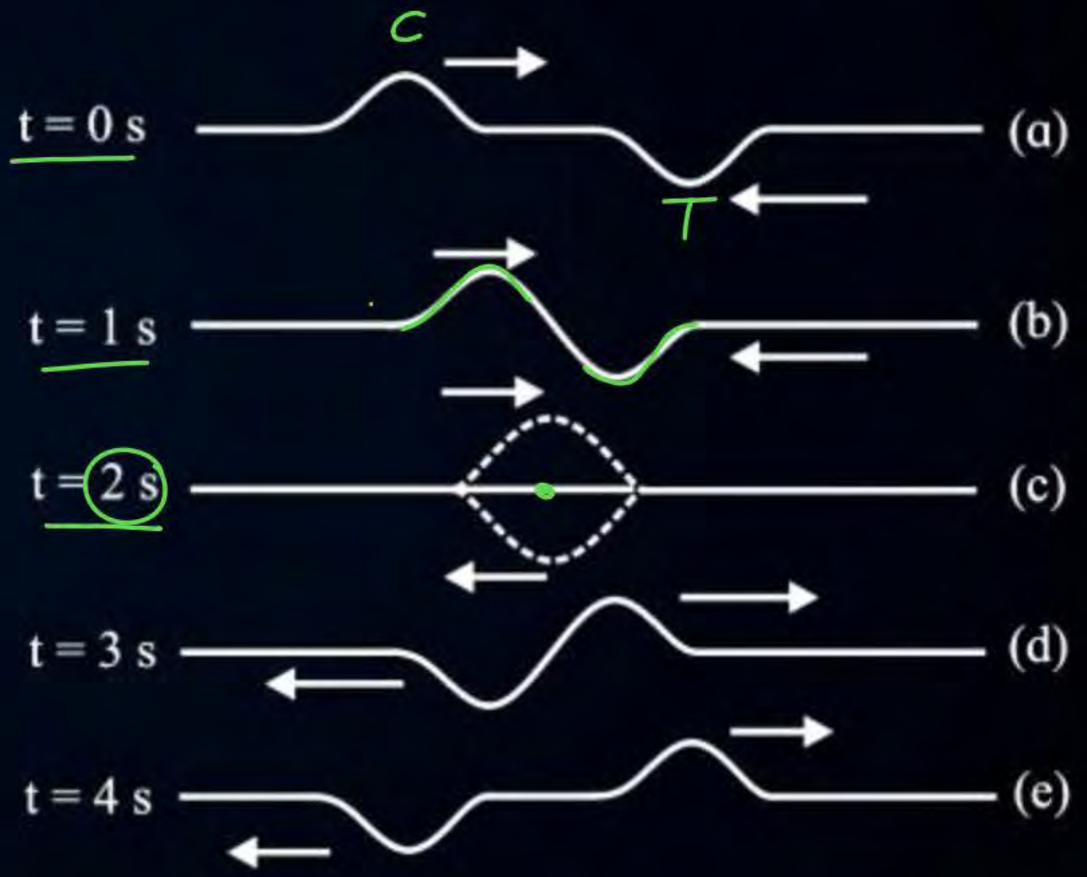


Superposition of Waves

When two or more wave travelling through a medium pass through a common point each wave produces its own displacement at that point independent of the presense of other wave. The resultant displacement will be vector sum of displacement produce by individual waves.

$$y = y_1 + y_2$$


c
c
t = 0 s
c
c
t = 1 s
t = 2 s
t = 3 s
t = 4 s
t = 5 s
t = 6 s


c
t = 0 s
(a)
T
t = 1 s
(b)
t = 2 s
(c)
t = 3 s
(d)
t = 4 s
(e)

- $y_1 = A_1 \sin \omega t$

  $y_2 = A_2 \sin(\omega t + \phi)$

  $y = y_1 + y_2$

  Refer composition of SHM.

  Home work.

Summary

1) Intro

2) Progressive wave.

3) Reflection of transverse & longitudinal waves.

4) Superposition of waves.

Homework

1) Revise lecture.

2) Solve questions on wave eqn.


धन्यवाद