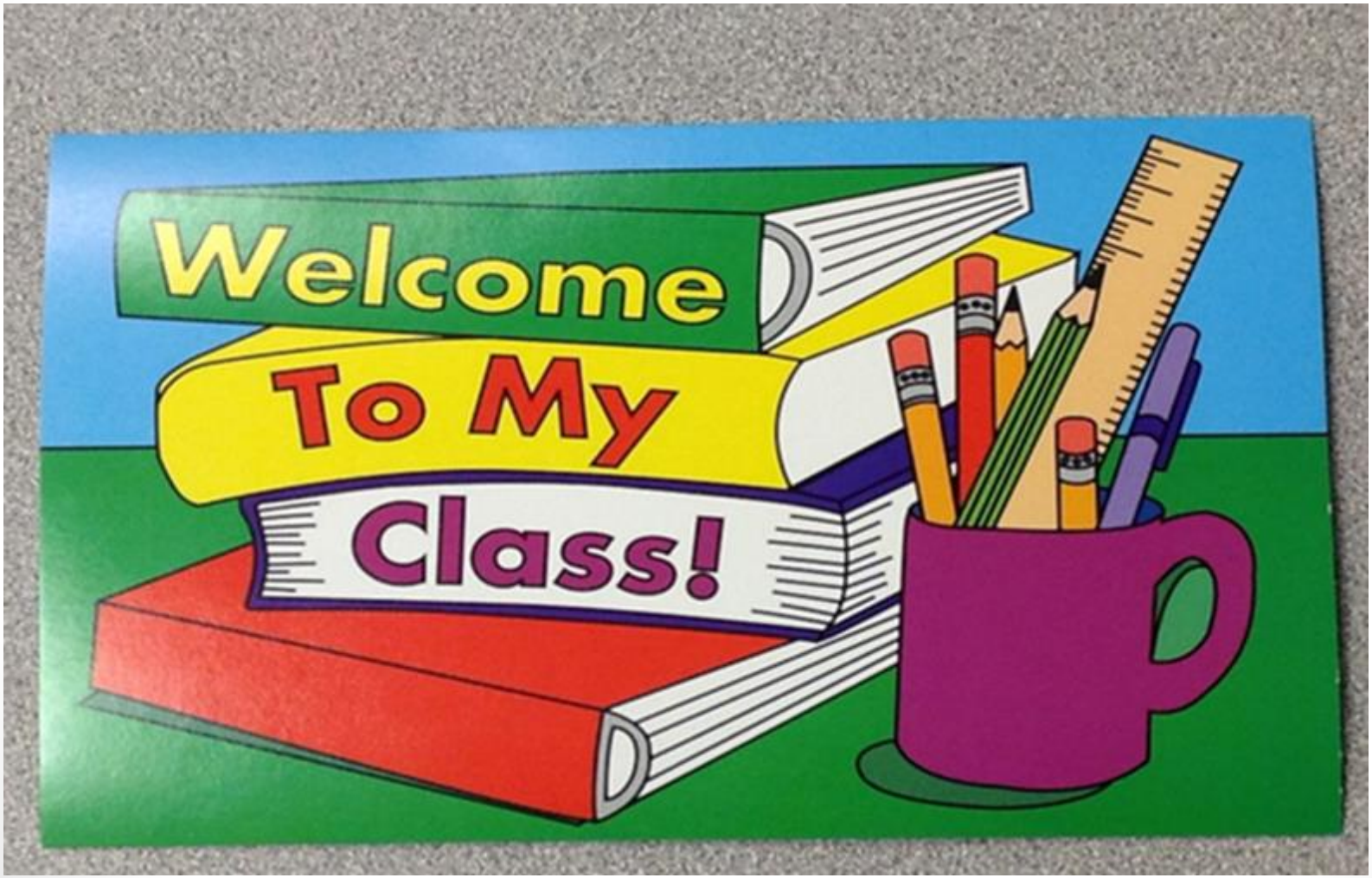
Pakistan School
Kingdom of Bahrain

Class :10 subject : Physics



Engaging starter

- Identify the types of waves;
- 1.Sound waves
- 2.Water waves
- 3. Radio waves
- 4. X rays

Topic

- Types of mechanical waves.

Objective

- At the end of this lesson students will be able to :
- Describe the types of mechanical waves.
- Solve the problems related to SHM

Mechanical waves :

- Mechanical waves:
- Waves which require any medium for their propagation are called mechanical waves In such types of waves the particles of the medium vibrate about their respective mean position and propagate disturbance in the forward direction.

Types of mechanical waves:

- There are 2 types of mechanical waves

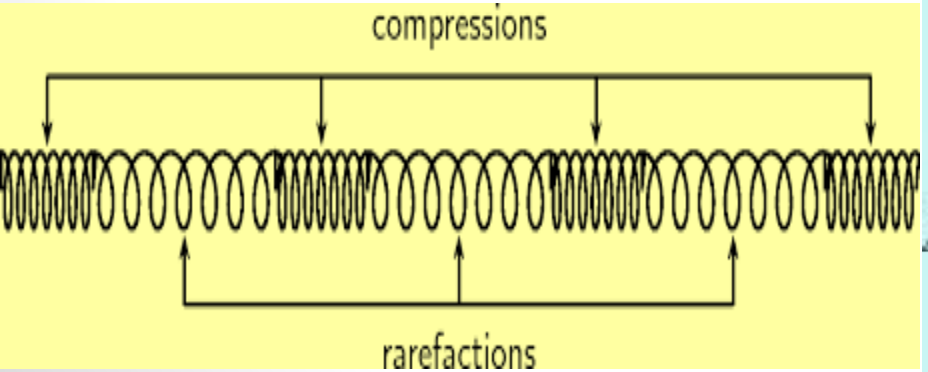
1. Longitudinal waves
2. Transverse waves

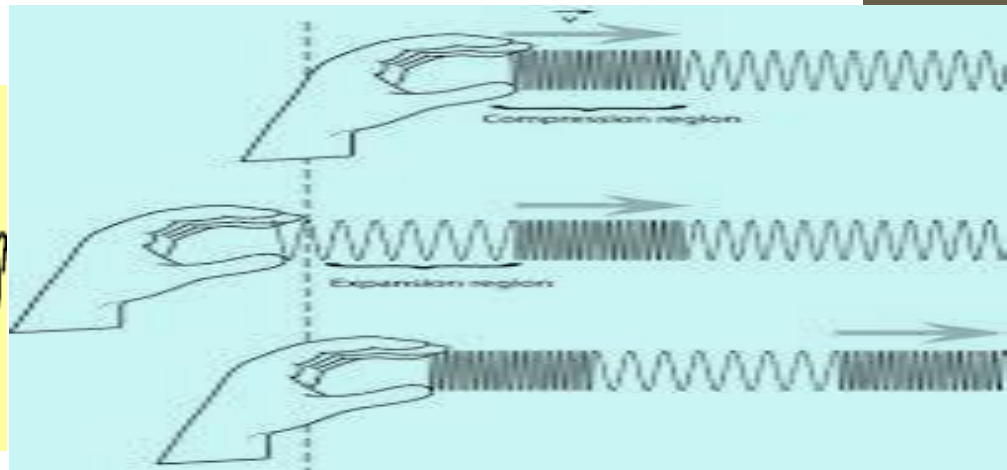
Longitudinal waves:

- In longitudinal waves the particles of the medium move back and forth along the direction of propagation of wave.

Explanation

- If we produce waves in spring:
- A series of disturbance is formed :
- 1.Compression:
- Place where loops of spring are closed together during vibration are called compressions.
- 2. Rarefaction:
- Place where loops of spring are far apart /having gaps during vibration are called rarefactions





Longitudinal Waves:

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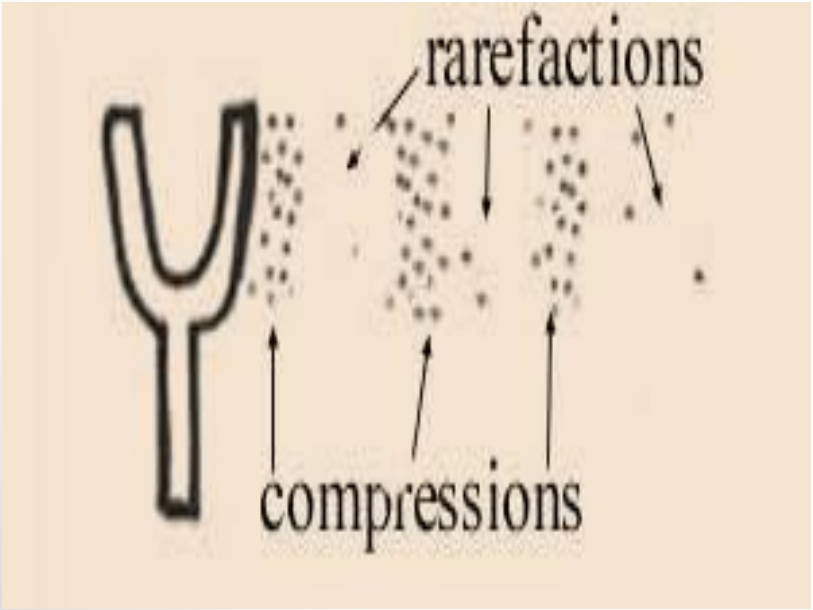
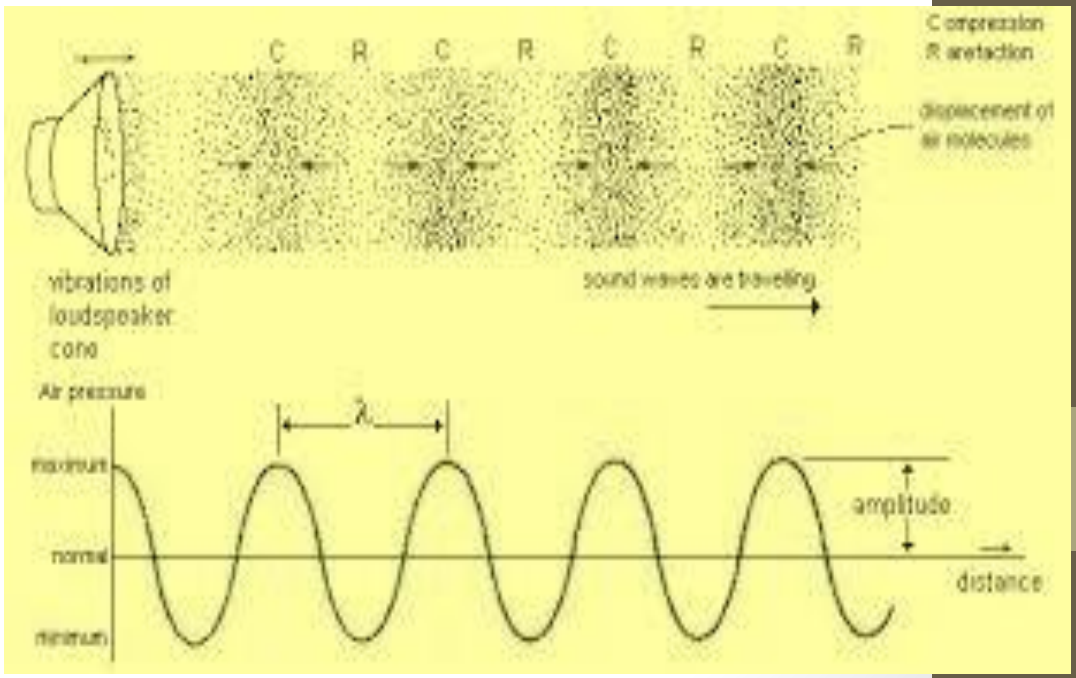
- Examples:
- 1. Sound Waves.
- 2. The waves produced in the mass attached with a spring.



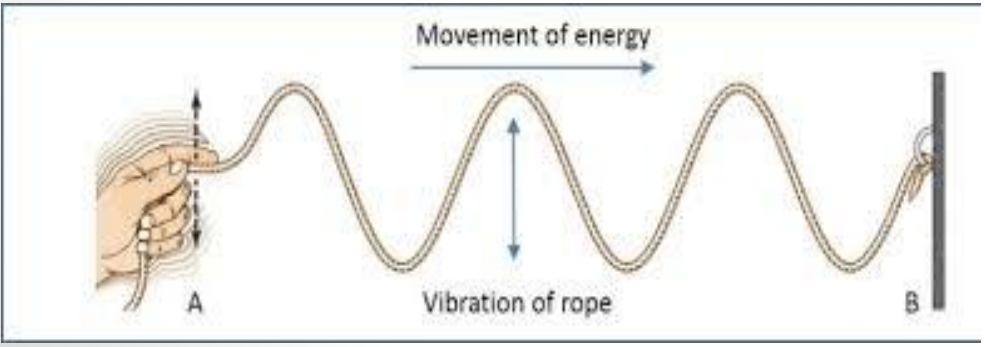


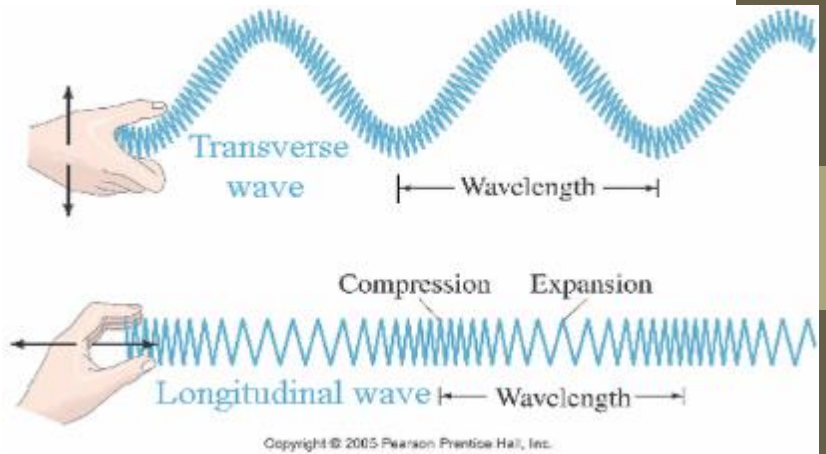
Transverse waves:

- The type of mechanical waves in which the particles of the medium vibrate perpendicular to the direction of propagation of the wave are called transverse waves.

Examples:

- (i) I f one end of the pencil is dipped in water and then move up and down waves are produced on the surface of water due to which the particles of the medium vibrate up and down, which means that direction of vibratory motion of water particles is perpendicular to the direction of waves.
- (ii) The waves produced by moving one end of stretched string up and down also produces transverse wave because different parts of the string vibrate perpendicular to the string.





pendulum is 2s .what will be its

Solution

Given Data

Time period = T = 2sec

Gravitation acceleration = $g_e = 10 ms^{-2}$ on the earth.

Gravitation acceleration $= g_m = \frac{g_e}{6} = \frac{10}{6}$

$g_m = 1.67\ ms^{-2}$ on the moon

$\pi = \frac{22}{7} = 3.14$

(a) Length of pendulum on earth $= l_e = ?$

(b) Length of pendulum on moon $= l_m = ?$

Formula:

$$T = 2\pi\sqrt{\frac{l}{g}}$$

By taking square on B.S

$$T^2 = (2\pi)^2\left(\sqrt{\frac{l}{g}}\right)^2$$

$$T^2 = 4\pi^2$$

$$\Rightarrow \quad l = \frac{T^2 \times g}{4\pi^2}$$

Length of pendulum on the Earth.

$$l_e = \frac{T^2 \times (g_e)}{4\pi^2}$$

$$l_e = \frac{(2)^2(10)}{(3.14)^2}$$

$$l_e = \frac{4(10)}{4(9.8596)}$$

$$l_e = \frac{10}{9.8596}$$

$l_e = 1.014m$ Answer.

Length of pendulum on moon

Length of pendulum moon

$$l_m = \frac{T^2 \times (g_m)}{4\pi^2}$$

$$l_m = \frac{(2)^2(1.67)}{(3.14)^2}$$

$$l_m = \frac{4(1.67)}{4(9.8596)}$$

$$l_m = \frac{1.67}{9.8596}$$

$l_m = 0.17$ Answer:

Q .10.2 A pendulum of length 0.99m is taken to the moon by an astronaut. The period of the pendulum 4.9 s. what is the value of g on surface of the moon?

Solution:

Given Data

Length of pendulum of moon $=l_m=0.99m$

Time period of pendulum on moon = T = 4.9sec

Gravitational acceleration on moon = g_m=?

$$\pi = \frac{22}{7} = 3.1$$

Formula:

At the surface of moon

$$T = 2\pi\sqrt{\frac{l_m}{g_m}}$$

S.B.S

$$T^2 = 4\pi\frac{l_m}{g_m}$$

$$g_m = 4\pi^2\frac{l_m}{T^2}$$

S.B.S

$$T^2 = 4\pi \frac{l_m}{g_m}$$

$$g_m = 4\pi^2 \frac{l_m}{T^2}$$

$$g_m = 4\,(3.14)^2 \frac{(0.99)}{(4.9)2}$$

$$g_m = \frac{4(0.8596)(0.99)}{24.01}$$

$$g_m = \frac{39.044}{24.01}$$

$$g_m = 1.626 ms^{-2}$$

$$g_m = 1.63\ ms^{-2}\ \text{Answer}$$

Find the time period of a simple pendulum of 1 m length placed on earth .

- Given
- To find :
- Solution
- Formula =

Calculation:

- Answer : Time period = ……s

Plenary

- ……waves required medium for their propagation .
- Describe any example of mechanical waves.
- Mechanical waves has ….. Types (2,3,4)
- In transverse waves particles of medium vibrate ….. To propagation of wave . (along / perpendicular)
- In longitudinal waves particles of medium vibrate back and forth along the propagation of wave . T/F

Home work

- Chapter :10
- Page no 18
- Numerical problem 10.3
- Solve it in your notebook.


STAY HOME!
STAY SAFE!

- Allah Hafiz