

**1. Define motion.**

Motion is a natural event that involves a change in the position or location of an object with time.

**2. What is need for the study of motion of objects?**

Study of motion of objects is needed because:

- a) Chemical reactions are possible only because of movement and collision.
- b) Geologists use physics of waves to study and measure the tectonic plate motion and predict earthquakes.
- c) Cosmologists use physics to study the behaviour of heavenly bodies.
- d) Doctors use it to map the flow of blood to check whether the arteries are blocked.

**3. Give examples of motion that is not easily detected.**

- a) Constituents of solid are in a state of continuous vibration, not visible to the naked eye.
- b) The revolution and spin of the earth is not detected inspite of their high speed.
- c) Theory of plate tectonics tells us that the continents are drifting at the slow speed.

**4. How is a wave produced?**

A wave is produced by the periodic disturbance at a point in a medium.

**5. How is the energy transferred in a wave without transfer of particles of the medium?**

When a wave propagates in a medium, the particles of the medium vibrate about their mean position and the energy is transferred without the transfer of particles of the medium.

**6. Do the particles of the medium in which a wave moves travel along with the wave? Explain with an example.**

**OR**

**Take some water in a trough and float a piece of cork in it. When the water is disturbed, the cork moves up and down but not forward. Why?**

When a wave propagates in a medium, the particles of the medium vibrate about their mean position and the energy is transferred without transfer of the particles of the medium.

For example: Take some water in a trough and float a piece of cork in it. When the water is disturbed, the cork moves up and down but not forward.

**7. What is wave velocity?**

Velocity of the disturbance transmitted in a medium is called wave velocity.

**8. On what factor does the velocity of wave depend?**

Velocity of wave depends on the nature of the medium and not on the energy content.

**9. Write the relation between wavelength and frequency of a wave.**

Wavelength and frequency are related by the equation  $V = n \lambda$

**10. What is wavelength and frequency of a wave?**

The distance between two consecutive compressions or rarefaction is called wavelength.

The number of waves in unit time is called frequency of wave.

**11. Write the relation between time period and frequency of the wave.**

Time period and frequency of the wave are related by the equation  $T = \frac{1}{n}$

**12. If we double the frequency of a vibrating object, what happens to its time period?**

As time period is inversely proportional to its frequency, when the frequency is doubled, its time period becomes half.

If the original time period is  $T = \frac{1}{n}$ , When it frequency is doubled it becomes  $T = \frac{1}{2n}$

**13. What are mechanical waves? Give example.**

The waves which need a material medium for their propagation are called mechanical waves. They can travel only in material medium like water, air and earth.

Ex: Sound waves

**14. What are transverse waves?**

The waves in which particles vibrate in the direction perpendicular to the direction of wave propagation are called transverse waves. Ex: Visible light, ultraviolet waves, x-rays etc.

**15. What are longitudinal waves?**

The waves in which particles vibrate along the direction of the propagation are called longitudinal waves. Ex: Sound waves.

**16. Distinguish between transverse waves and longitudinal waves.**

| Transverse waves  | Longitudinal waves   |
|---|--|
| 1. Particles vibrate in the direction perpendicular to the direction of wave propagation. | 1. Particles vibrate along the direction of the propagation.         |
| 2. The wave propagates in the form of crests and troughs.                                 | 2. The wave propagates in the form of compressions and rarefactions. |
| 3. One crest and one trough constitute a wave.  | 3. One compression and one rarefaction constitute a wave.            |
| Ex: Light waves, waves on the surface of water, waves on a string                         | Ex: Sound waves, vibration in gases, oscillation of spring.          |

**17. What are electromagnetic waves?**

The waves associated with electric and magnetic fields, resulting from the acceleration of an electric charge are called electromagnetic waves. They require no material medium for their propagation.

Ex: Visible light, Ultraviolet light, x-rays, radio waves etc.

- 18. In wave motion, energy is transmitted from one place to another. Can the wave energy be transformed into any other form?**

Yes, movement of large quantities of water up and down in the seas and oceans in the form of waves can be converted into mechanical energy and electrical energy.

- 19. When a rope is tied to hook and one end of the rope is moved up and down, a wave starts from the point where it is being held and moves to the other end. Identify the wave produced.**

As the rope is moving up and down i.e. perpendicular to the direction of propagation of the wave, it is transverse waves.

- 20. A 50Hz vibrator produces air waves that speed out at  $340\text{ms}^{-1}$ . What is a) its time period? b) its wavelength?**

- 21. The wavelength of a longitudinal wave is 1cm and its velocity in air is  $330\text{ms}^{-1}$ . Find the frequency of the wave.**

22. The frequency of a sound wave is 256Hz and its wavelength is 1.2m. Calculate its wave velocity.

23. If the frequency of a transverse wave is 10Hz and the distance between the two consecutive wave crests is 2m. Calculate the wave speed.

24. Define simple harmonic motion and give examples.

Motion which repeats after regular intervals of time is called simple harmonic motion.

Ex: Oscillation of simple pendulum, vibration of a tuning fork.

25. Define the following with reference to simple harmonic motion.

a) Amplitude b) Oscillation c) Time period

a) The maximum displacement of the particle on either side of the equilibrium position is called amplitude.

b) One complete to and fro motion of the particle about its mean position is called oscillation

c) The time taken by the body to complete one oscillation is called time period (T)

26. Give example of simple harmonic motion.

a) Oscillation of simple pendulum.

b) When a tuning fork is hit against a rubber pad, its prongs execute simple harmonic motion.

c) When the load is attached to the lower end of a spring suspended from a support is pulled and released, it executes simple harmonic motion.

d) When the bus is in the clutch gear, we see a vibration and hear the sound produced by it. This is simple harmonic motion.

**27. Give the practical applications of simple harmonic motion.**

- Simple harmonic motion of a pendulum was used for the measurement of time.
- Tuning the musical instrument is done with the vibrating tuning fork which executes simple harmonic motion.
- Study of waves is indirectly the study of simple harmonic motion.
- The study of molecules is made with the help of vibration spectrum.

**28. Write the formula to find the time period of a simple pendulum.**

Time period of a simple pendulum is calculated using the formula  $T = 2\pi\sqrt{\frac{l}{g}}$

Where  $l$  is the effective length of the pendulum.  $g$  is the gravitational acceleration.

**Fill in the blanks:**

- A natural event that involves a change in the position or location of an object with time is called **motion**.
- Chemical reactions are possible only because of **movement and collision**.
- Geologists** use physics of waves to study and measure the **tectonic plate motion** and predict earthquakes.
- Cosmologists use physics to study the behaviour of heavenly bodies.
- A wave is produced by the **periodic disturbance** at a point in a medium.
- Velocity of the disturbance transmitted in a medium is called **wave velocity**.
- Speed / Velocity of wave depends on the **nature of the medium**.
- Velocity of wave does not depend on the **energy content**.
- Wavelength and frequency are related by the equation  **$V = n\lambda$**
- The distance between two consecutive compressions or rarefaction is called **wavelength**.
- The S.I unit of wavelength is **metre (m)**.
- The number of waves occurring in unit time is called **frequency**.
- The unit of measurement of frequency of a wave is **hertz(Hz)**.
- Time period and frequency of the wave are related by the equation  **$T = \frac{1}{n}$**
- Very large distances which could not be measured were called **celeris**.
- Waves which need a material medium for their propagation are called **mechanical waves**.
- The waves in which particles vibrate in the direction perpendicular to the direction of wave propagation are called **transverse waves**.
- The waves in which particles vibrate along the direction of the propagation are called **longitudinal waves**.
- In a longitudinal wave, the vibration of particles and the direction of wave are **in the same direction**.
- An example of transverse waves is visible light/Ultraviolet light/x-rays.

21. An example of longitudinal waves is sound waves/vibrations in gases/oscillations of spring.
22. The waves associated with electric and magnetic fields, resulting from the acceleration of an electric charge are called **electromagnetic waves**.
23. Electromagnetic waves are **transverse waves**.
24. Potential energy is maximum, when the bob is at **the position of maximum displacement**.
25. Motion which repeats after regular intervals of time is called **simple harmonic motion**.
26. Oscillation of pendulum is an example of simple harmonic motion.
27. The maximum displacement of the particle on either side of the equilibrium position is called **amplitude**.
28. One complete to and fro motion of the particle about its mean position is called **oscillation**.
29. The time taken by the body to complete one oscillation is called **time period**.
30. The prongs of
31. The formula to find the effective length of a simple pendulum is  $T = 2\pi\sqrt{\frac{l}{g}}$

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