Class 10 Physics
Chapter 10 Notes

Review Questions

10.1 What is simple harmonic motion? What are necessary conditions for a body to execute simple harmonic motion?

Ans. Simple Harmonic Motion (SHM)

To and fro motion of a body about its mean position in which acceleration of the body is directly proportional to the displacement of the body from the mean position and acceleration is always directed towards the mean position is known as simple harmonic motion.

Conditions of SHM

There are two conditions necessary for a body to execute simple harmonic motion.

1. The acceleration of the body is directly proportional to its displacement from the mean position.
2. The acceleration of the body is always directed towards the mean position. Mathematically both the conditions can be written as $a \propto -x$.

10.2 Think of several examples of motion in everyday life that are simple harmonic.

Ans. Examples of simple harmonic motion from daily life are:

a. Motion of a pendulum in wall clocks
b. Motion of a Swing
c. Motion of Car Shock Absorbers
d. Motion of strings in musical instruments
e. Motion of a Baby Cradle

10.3 What are damped oscillations? How damping progressively reduces the amplitude of oscillation?

Ans. The oscillations of a system in the presence of some resistive force are damped oscillations.

The force of friction retards the motion, so the systems do not oscillate indefinitely. The friction reduces the mechanical energy of the system as time passes, and the motion is said to be **damped**. This damping progressively reduces the amplitude of the vibration of motion.

10.4 How can you define the term wave? Elaborate the difference between mechanical and electromagnetic waves with examples.

Ans: WAVE

A wave is a disturbance in a medium which causes the particles of the medium to undergo vibratory motion about their mean position in equal intervals of time. There are two categories of waves.

1. **Mechanical Waves**

   The waves which require medium for their propagation are called mechanical waves. e.g. water waves, sound waves, waves produced in the strings.

2. **Electromagnetic Waves**

   The waves which do not require any medium for their propagation are called electromagnetic waves. e.g. Radio waves, T.V waves, heat and light waves.

10.5 Distinguish between longitudinal and transverse waves with suitable examples.

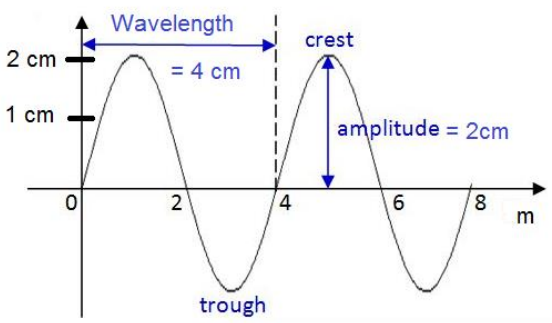
Ans. Longitudinal Waves

Those waves in which the particles of medium move back and forth along the direction of waves are called longitudinal waves. These waves consist of compressions and rarefactions. e.g. if we give a regular push and pull to a spring placed on a horizontal table while one end of spring is fixed. Compressions and rarefactions will be seen moving along the direction of the waves.

Transverse Waves

Those waves in which the particles of medium move perpendicular to the direction of waves are called transverse waves. These waves consist of crests and troughs. e.g. if we move a horizontal spring fixed at one end on a table. We hold the other end and move it up and down. The crests and troughs will be seen moving perpendicular to the direction of the waves.

10.6 Draw a transverse wave with amplitude of 2 cm and a wavelength of 4 cm. Label a crest and trough on the wave.



10.7 Derive a relationship between velocity, frequency and wavelength of a wave. Write a formula relating of a wave to its time period and wavelength. OR Prove that v=f λ

Ans: WAVE EQUATION: The speed of an object is obtained by dividing the total distance covered by the object with the time taken.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$v = \frac{d}{t}$$

In case of waves, the distance of one wave length is covered in a time of one time period. Therefore

$$\text{Wave speed} = \frac{\text{Wavelength}}{\text{Time period}}$$

or $$v = \frac{\lambda}{T}$$

$$v = \lambda \times \frac{1}{T}$$

$$\mathbf{v = f\ \lambda} \quad \left(\text{As } \frac{1}{T} = f\right)$$

10.8. Waves are the means of energy transfer without transfer of matter. Justify this statement with the help of a simple experiment.

Ans. Waves can carry energy from one place to another without transfer of medium. It can be proved by the following experiment.

EXPERIMENT:

Drop a stone in a pond of water. Water waves will be produced on the surface of water place a cork at some distance on the surface of water. When the waves will reach the cork, it will start moving up and down showing that energy has transferred from the stone to the cork by means of waves without transfer of medium. The cork moves up and down but its net displacement is zero.

10.9 Explain the following properties of waves with reference to ripple tank experiment:

a. Reflection b. Refraction c. Diffraction

Ans. a. Reflection

We can define reflection of waves as: “When waves moving in one medium fall on the surface of another medium, they bounce back into the first medium such that the angle of incidence is equal to the angle of reflection.”

b. Refraction

We can define refraction as: **“**When a wave from one medium enters into the second medium at some angle, its direction of travel changes.”

c. Diffraction

We can define diffraction as: “The bending or spreading of waves around the sharp edges or corners of obstacles or slits is called diffraction.”

10.10 Does increasing the frequency of a wave also increase its wavelength? If not then how are these quantities related?

Ans. Increasing the frequency does not increase the wavelength of a wave because $v = f \lambda$. Increasing the frequency, the wavelength will decrease. They are inversely proportional to each other.