

# 15 Lecture - PHY101

## Important Subjective

**What is an oscillation?**

**Ans:** An oscillation is the repetitive motion of an object or a system about a fixed point or an equilibrium position.

**What is the difference between amplitude and frequency?**

**Ans:** Amplitude is the maximum displacement of an oscillating object from its equilibrium position, while frequency is the number of oscillations per unit time.

**What is simple harmonic motion?**

**Ans:** Simple harmonic motion occurs when the restoring force is proportional to the displacement from the equilibrium position, and the motion is periodic and sinusoidal.

**What is Hooke's law?**

**Ans:** Hooke's law states that the force required to stretch or compress a spring is proportional to the displacement.

**What is the equation of motion for a simple harmonic oscillator?**

**Ans:** The equation of motion

**Define simple harmonic motion.**

**Answer:** Simple harmonic motion is a type of periodic motion where the displacement of an object is proportional to the force acting on it and is directed toward the equilibrium position. The motion is characterized by a constant frequency, amplitude, and sinusoidal waveform.

**What is the difference between a period and frequency of oscillation?**

**Answer:** Period and frequency are two different ways to describe the motion of a system undergoing oscillation. Period is the time required for one complete cycle of oscillation, whereas frequency is the number of complete cycles that occur per unit of time. They are related by the formula  $T = 1/f$ , where  $T$  is the period

and  $f$  is the frequency.

### **What is meant by the amplitude of an oscillation?**

**Answer:** Amplitude is the maximum displacement of an oscillating system from its equilibrium position. It is a measure of the extent to which the system deviates from its mean position during the course of its oscillation.

### **What is resonance?**

**Answer:** Resonance occurs when an oscillating system is subjected to a periodic driving force that has the same frequency as its natural frequency of vibration. As a result, the amplitude of the oscillation of the system becomes very large, which can lead to catastrophic failure if not properly managed.

### **What is the difference between damped and undamped oscillations?**

**Answer:** Damped oscillations occur when the amplitude of an oscillating system decreases over time due to the presence of friction or other dissipative forces. Undamped oscillations, on the other hand, occur when the amplitude of the oscillating system remains constant over time in the absence of any external forces.

### **What is meant by the period of oscillation of a pendulum?**

**Answer:** The period of oscillation of a pendulum is the time required for the pendulum to complete one full oscillation, i.e., to swing from one extreme position to the other and back again.

### **What is the relationship between the mass of an object and its period of oscillation in a simple harmonic oscillator?**

**Answer:** The period of oscillation of a simple harmonic oscillator is independent of the mass of the object undergoing oscillation. This is because the restoring force acting on the object is proportional to its displacement, not its mass.

### **What is the relationship between the spring constant and the period of oscillation in a mass-spring system?**

**Answer:** The period of oscillation of a mass-spring system is directly proportional to the square root of the mass attached to the spring and inversely proportional to the square root of the spring constant. This relationship is given by the formula  $T = 2\pi\sqrt{m/k}$ , where  $T$  is the period,  $m$  is the mass, and  $k$  is the spring constant.

### **What is meant by the term "phase" in the context of oscillations?**

**Answer:** Phase refers to the relative position of an oscillating system at a given point in time with respect to its starting position. It is often expressed in terms of the angle of displacement from the equilibrium position, or as a fraction of the period completed.

**What is the relationship between the period of a wave and its wavelength?**

**Answer:** The period of a wave is directly proportional to its wavelength and inversely proportional to its frequency. This relationship is given by the formula  $T = \lambda/f$ , where  $T$  is the period,  $\lambda$  is the wavelength, and  $f$  is the frequency.