

CLASS 11

PHYSICS

EXTRA QUESTIONS

Class 11 Physics Chapter 13 Oscillations – Extra Questions with Answers

Extra practice questions for Class 11 Physics Chapter 13 (Oscillations), beyond the textbook. These Class 11 Physics Chapter 13 important questions are handy for last-minute exam practice.

Contents

Very Short Answer Questions (1 mark)

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Class 11 Physics Chapter 13 – Solutions and Notes

Extra practice questions for Class 11 Physics Chapter 13 (Oscillations), beyond the textbook. These Class 11 Physics Chapter 13 important questions are handy for last-minute exam practice.

Very Short Answer Questions (1 mark)

Q1. Write the differential condition for SHM.

Ans: $a = -\omega^2 x$ (acceleration proportional to and opposite of displacement).

Q2. What is the formula for the time period of a spring-mass system?

Ans: $T = 2\pi\sqrt{m/k}$.

Q3. At the mean position, what is the velocity and acceleration in SHM?

Ans: Velocity is maximum; acceleration is zero.

Q4. At extreme position, what is the velocity in SHM?

Ans: Zero.

Q5. Write the total energy formula for a particle in SHM.

Ans: $E = \frac{1}{2}m\omega^2 A^2$.

Short Answer Questions (2–3 marks)

Q6. A simple pendulum has length 1 m. Find its time period ($g = 9.8 \text{ m/s}^2$).

Ans: $T = 2\pi\sqrt{l/g} = 2\pi\sqrt{1/9.8} = 2\pi(0.319) \approx 2 \text{ s}$.

Q7. A particle in SHM has amplitude 0.1 m and angular frequency 5 rad/s. Find its maximum velocity and maximum acceleration.

Ans: $v_{\max} = A\omega = 0.1(5) = 0.5 \text{ m/s}$. $a_{\max} = A\omega^2 = 0.1(25) = 2.5 \text{ m/s}^2$.

Q8. A mass of 0.5 kg is attached to a spring of spring constant 200 N/m. Find the period of oscillation.

Ans: $T = 2\pi\sqrt{m/k} = 2\pi\sqrt{0.5/200} = 2\pi(0.05) \approx 0.314 \text{ s}$.

Higher-Order Thinking / Application Questions

Q9. A particle executes SHM with amplitude 4 cm and angular frequency 2 rad/s. Find its displacement, velocity, and acceleration at t such that $\omega t = \pi/6$ (taking $\phi = 0$), and explain the relationship between the three at this instant.

Ans: $x = A \sin(\omega t) = 4 \sin(30^\circ) = 4(0.5) = 2 \text{ cm}$. $v = A\omega \cos(\omega t) = 4(2)\cos(30^\circ) = 8(0.866) = 6.93 \text{ cm/s}$.

$a = -\omega^2 x = -4(2) = -8 \text{ cm/s}^2$. At this instant, the particle is partway between the mean and extreme positions; its velocity is still fairly large (not yet zero) while its acceleration (which always points back toward the mean position) is negative, correctly opposing the positive displacement, confirming that acceleration in SHM always acts as a restoring influence proportional to displacement.

Q10. Explain why the kinetic energy and potential energy of a particle in SHM continuously interconvert, and describe how their sum behaves throughout one complete oscillation, using energy conservation reasoning.

Ans: In SHM, as a particle moves from the mean position toward an extreme position, its speed decreases (approaching zero at the extreme) while the restoring force (and hence potential energy stored, $\frac{1}{2}m\omega^2 x^2$) increases, since displacement from the mean position increases. Conversely, as the particle moves back from an extreme position toward the mean position, potential energy converts back into kinetic energy, with

speed (and KE) becoming maximum exactly at the mean position where displacement (and PE) is zero. Because SHM is an idealized frictionless oscillation, no energy is lost to non-conservative forces, so by the law of conservation of energy, the total mechanical energy $E = KE + PE = \frac{1}{2}m\omega^2 A^2$ remains constant throughout the motion, even though the individual KE and PE values vary periodically and continuously interconvert into one another.

Class 11 Physics Chapter 13 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [Class 11 Physics Chapter 13 Solutions](#) and [Class 11 Physics Chapter 13 Revision Notes](#).

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