

Worksheet: Oscillations

IB · Class 11 · Physics · 10 questions · 31 marks

Name: _____

Date: _____

Score: _____ / 31

Q1. A particle's acceleration and displacement are related by $a = -5x$ (SI units). Is this SHM? If so, find the angular frequency. *[2 marks]*

Q2. A particle completes 20 oscillations in 4 seconds. Find its frequency and period. *[2 marks]*

Q3. Classify each as periodic or non-periodic: (a) $\sin(\omega t)$, (b) $e^{(-t)}$. *[2 marks]*

Q4. A particle executes SHM with angular frequency $\omega = 2$ rad/s. At $t = 0$, its displacement is 3 cm and its velocity is -8 cm/s. Find the amplitude and phase constant using $x(t) = A \cos(\omega t + \phi)$. *[3 marks]*

Q5. A particle executes SHM: $x(t) = 4 \cos(2t + \pi/6)$ cm. Find its velocity and acceleration at $t = \pi/6$ s. *[3 marks]*

Q6. A 0.5 kg mass attached to a spring oscillates with a period of 0.2π s. Find the spring constant. [3 marks]

Q7. A particle of mass 2 kg executing SHM has total energy 16 J and amplitude 0.4 m. Find the force constant k , and the kinetic energy when the displacement is 0.2 m. [3 marks]

Q8. Find the length of a simple pendulum whose period is exactly 4 s on Earth's surface ($g = 9.8 \text{ m/s}^2$). [3 marks]

Q9. A simple pendulum of length 1.0 m is taken to the Moon, where $g = 1.7 \text{ m/s}^2$. (a) Find its period on the Moon. (b) By what factor does the period change compared to Earth ($g = 9.8 \text{ m/s}^2$)? [5 marks]

Q10. Two identical springs, each of spring constant k , are connected in series and attached to a mass m at the free end, with the other end of the combination fixed to a wall. Find the period of oscillation. [5 marks]