

JEE MAIN OSCILLATIONS — VELOCITY AND ACCELERATION IN SHM — PYQS

Max. Marks: 36
Questions: 9

Section A (MCQ) — 3 questions

- Q.1** The equation of motion of a particle is given by $x = a \sin(50t + \pi/3)$ cm. The particle will come to rest at time t_1 and it will have zero acceleration at time t_2 . The t_1 and t_2 respectively are _____.

[JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) $\frac{\pi}{300}$ s, $\frac{\pi}{75}$ s (2) $\frac{\pi}{75}$ s, $\frac{\pi}{300}$ s
 (3) $\frac{\pi}{300}$ s, $\frac{\pi}{25}$ s (4) $\frac{\pi}{50}$ s, $\frac{\pi}{100}$ s

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- Q.2** A block of mass 2 kg is attached to one end of a massless spring whose other end is fixed at a wall. The spring-mass system moves on a frictionless horizontal table. The spring's natural length is 2 m and spring constant is 200 N/m. The block is pushed such that the length of the spring becomes 1 m and then released. At distance x m ($x < 2$) from the wall, the speed of the block will be

[JEE Main 2025 (Online) 8th April Evening Shift]

- (1) $10[1 - (2 - x)^2]^{\frac{1}{2}}$ m/s
 (2) $10[1 - (2 - x)^2]^{\frac{3}{2}}$ m/s
 (3) $10[1 - (2 - x)^2]$ m/s
 (4) $10[1 - (2 - x)^2]^2$ m/s

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- Q.3** A particle is subjected to two simple harmonic motions as : $x_1 = \sqrt{7} \sin 5t$ cm and $x_2 = 2\sqrt{7} \sin\left(5t + \frac{\pi}{3}\right)$ cm where x is displacement and t is time in seconds. The maximum acceleration of the particle is $x \times 10^{-2}$ m s⁻². The value of x is :

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) $5\sqrt{7}$ (2) 125
 (3) $25\sqrt{7}$ (4) 175

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Section B (Numerical) — 6 questions

- Q.4** The velocity of a particle executing simple harmonic motion along x -axis is described as $v^2 = 50 - x^2$, where x represents displacement. If the time period of motion is $\frac{x}{7}$ s, the value of x is _____. [JEE Main 2026 (Online) 4th April Morning Shift]

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- Q.5** The position, velocity and acceleration of a particle executing simple harmonic motion are found to have magnitudes of 4 m, 2 ms⁻¹ and 16 ms⁻² at a certain instant. The amplitude of the motion is $\sqrt{x}$ m where x is _____. [JEE Main 2024 (Online) 9th April Morning Shift]

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- Q.6** A particle is doing simple harmonic motion of amplitude 0.06 m and time period 3.14 s. The maximum velocity of the particle is _____ cm/s. [JEE Main 2024 (Online) 6th April Morning Shift]

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- Q.7** The displacement of a particle executing SHM is given by $x = 10 \sin\left(\omega t + \frac{\pi}{3}\right)$ m. The time period of motion is 3.14 s. The velocity of the particle at $t = 0$ is _____ m/s. [JEE Main 2024 (Online) 4th April Evening Shift]

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- Q.8** A particle performs simple harmonic motion with amplitude A . Its speed is increased to three times at an instant when its displacement is $\frac{2A}{3}$. The new amplitude of motion is $\frac{nA}{3}$. The value of n is _____. [JEE Main 2024 (Online) 31st January Morning Shift]

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- Q.9** A particle executes simple harmonic motion with an amplitude of 4 cm. At the mean position, velocity of the particle is 10 cm/s. The distance of the particle from the mean position when its speed becomes 5 cm/s is $\sqrt{\alpha}$ cm, where $\alpha = \underline{\hspace{2cm}}$.

[JEE Main 2024 (Online) 27th January Morning Shift]

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full solution



ANSWER KEY

Section A (MCQ) — 3 questions

Ques.	1	2	3								
Ans.	1	1	4								

Section B (Numerical) — 6 questions

Ques.	4	5	6	7	8	9					
Ans.	44	17	12	10	7	12					