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JEE

Prayas JEE (2025)

Physics

Oscillations

DPP: 7

Q1 The potential energy of a particle of mass m executing SHM is given by $U = A(1 - \cos 2x)$, where x is the instantaneous small displacement of the particle. The time period of oscillation is

(A) $\pi \sqrt{\dfrac{m}{A}}$

(B) $2\pi \sqrt{\dfrac{m}{A}}$

(C) $\pi \sqrt{\dfrac{m}{2A}}$

(D) $2\pi \sqrt{\dfrac{m}{2A}}$

Q2 A uniform rod of length l is suspended at $l/4$ from one end and made to undergo small oscillations. The time period of oscillation is:

(A) $2\pi \sqrt{\dfrac{7l}{12g}}$

(B) $2\pi \sqrt{\dfrac{3l}{7g}}$

(C) $2\pi \sqrt{\dfrac{7l}{3g}}$

(D) $2\pi \sqrt{\dfrac{4l}{5g}}$

Q3 The displacement of a particle executing simple harmonic motion is given by, $y = A_0 + A\sin\omega t + B\cos\omega t$. Then the amplitude of its oscillation is given by:

(A) $A + B$

(B) $A_0 + \sqrt{A^2 + B^2}$

(C) $\sqrt{A^2 + B^2}$

(D) $\sqrt{A_0^2 + (A + B)^2}$

Q4 When two displacements represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ are superimposed, the motion is:

(A) not a simple harmonic.

(B) simple harmonic with amplitude $\dfrac{a}{b}$.

(C) simple harmonic with amplitude $\sqrt{a^2 + b^2}$

(D) simple harmonic with amplitude $\dfrac{(a+b)}{2}$.

Q5 Two particles are in SHM in a straight line. Amplitude A and time period T of both the particles are equal. At time $t = 0$, one particle is at displacement $Y_1 = +A$ and the other at $Y_2 = -\dfrac{A}{2}$, and they are approaching towards each other. After what time they cross each other?

(A) $T/3$ (B) $T/4$

(C) $5T/6$ (D) $T/6$

Q6 The spring as shown in figure is kept in a stretched position with extension x when the system is released. Assuming the horizontal surface to be frictionless, the frequency of oscillation is
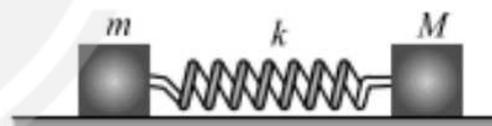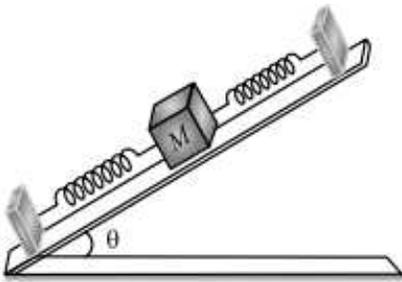

(A) $\dfrac{1}{2\pi} \sqrt{\dfrac{k(M+m)}{Mm}}$

(B) $\dfrac{1}{2\pi} \sqrt{\dfrac{mM}{k(M+m)}}$

(C) $\dfrac{1}{2\pi} \sqrt{\left[\dfrac{kM}{(m+M)}\right]}$

(D) $\dfrac{1}{2\pi} \sqrt{\dfrac{km}{(M+m)}}$

Q7 On a smooth inclined plane, a body of mass M is attached between two springs. The other ends of the springs are fixed to firm supports. If each spring has force constant K, the period of

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oscillation of the body (assuming the springs as massless) is

(A) $2\pi \left(\frac{M}{2K} \right)^{1/2}$

(B) $2\pi \left(\frac{2M}{K} \right)^{1/2}$

(C) $2\pi \frac{Mg \sin \theta}{2K}$

(D) $2\pi \left(\frac{2Mg}{K} \right)^{1/2}$

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Answer Key

Q1	(A)		Q5	(D)
Q2	(A)		Q6	(A)
Q3	(C)		Q7	(A)
Q4	(C)			

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