JEE

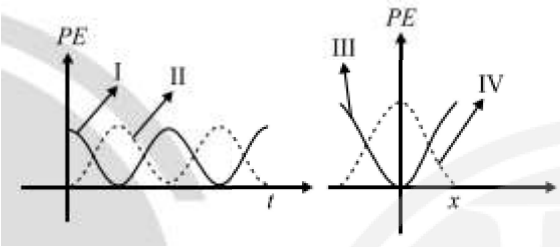
Prayas JEE (2025)

Physics

Oscillations

DPP: 6

Q1 For a particle executing S.H.M. the displacement x is given by $A\cos\omega t$. Identify the graph which represents the variation of potential energy (P.E.) as a function of time t and displacement x.



(A) I, III (B) II, IV
(C) II, III (D) I, IV

Q2 A spring of force constant k is cut into lengths of ratio $1:2:3$. They are connected in series and the new force constant is k'. Then they are connected in parallel and force constant is k''. Then $k':k''$ is
(A) $1:9$ (B) $1:11$
(C) $1:14$ (D) $1:6$

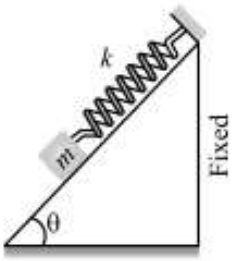
Q3 A particle executes linear simple harmonic motion with an amplitude of $3\ \text{cm}$. When the particle is at $2\ \text{cm}$ from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is
(A) $\frac{\sqrt{5}}{2\pi}$
(B) $\frac{4\pi}{\sqrt{5}}$
(C) $\frac{2\pi}{\sqrt{3}}$
(D) $\frac{\sqrt{5}}{\pi}$

Q4 A particle of mass m oscillates along x-axis according to equation $x = a\sin\omega t$. The nature of the graph between momentum and displacement of the particle is
(A) Circle
(B) Hyperbola
(C) Ellipse
(D) Straight line passing through origin

Q5 The period of oscillation of a mass M suspended from a spring of negligible mass is T. If along with it another mass M is also suspended, the period of oscillation will now be
(A) T
(B) $\frac{T}{\sqrt{2}}$
(C) $2T$
(D) $\sqrt{2}T$

Q6 A mass M is suspended from a massless spring. An additional mass m stretches the spring further by a distance x. The combined mass will oscillate with a period
(A) $2\pi\sqrt{\left\{\frac{(M+m)x}{mg}\right\}}$
(B) $2\pi\sqrt{\left\{\frac{mg}{(M+m)x}\right\}}\Bigg\}$
(C) $2\pi\sqrt{\left\{\frac{(M+m)}{mgx}\right\}}$
(D) $\frac{\pi}{2}\sqrt{\left\{\frac{mg}{(M+m)x}\right\}}$

Q7 In the figure shown the time period and the amplitude respectively, when m is left from rest when spring is relaxed are (the inclined plane is smooth)



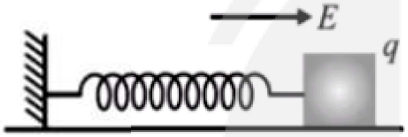
(A) $2\pi\sqrt{\frac{m}{k}}, \frac{mg\sin\theta}{k}$

(B) $2\pi\sqrt{\frac{m\sin\theta}{k}}, \frac{2mg\sin\theta}{k}$

(C) $2\pi\sqrt{\frac{m}{k}}, \frac{mg\cos\theta}{k}$

(D) None of these

Q8 A spring-block system shown in figure oscillates with a certain time period. If charge q is given to the block and a uniform field E is switched on, then its time period of oscillation



(A) Increases

(B) Decreases

(C) May increase or decrease

(D) Remains the same

Q9 A particle is executing linear S.H.M. between $[x = -A$ to $x = A]$. The time taken to go from 0 to $A/2$ is T_1 and to go from $A/2$ to A is T_2, then

(A) $T_1 < T_2$

(B) $T_1 > T_2$

(C) $T_1 = T_2$

(D) $T_1 = 2T_2$

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Answer Key

Q1	(A)	Q6	(A)
Q2	(B)	Q7	(A)
Q3	(B)	Q8	(D)
Q4	(C)	Q9	(A)
Q5	(D)		

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