JEE

Prayas JEE (2025)

Physics

Oscillations

DPP: 4

Q1 A particle starts performing simple harmonic motion. Its amplitude is A. At one time its speed is half that of the maximum speed. At this moment the displacement is

(A) $\frac{\sqrt{2}A}{3}$

(B) $\frac{\sqrt{3}A}{2}$

(C) $\frac{2A}{\sqrt{3}}$

(D) $\frac{3A}{\sqrt{2}}$

Q2 A simple pendulum performs simple harmonic motion about $x = 0$ with an amplitude a and time period T. The speed of the pendulum at $x = a/2$ will be

(A) $\frac{\pi a}{T}$

(B) $\frac{3\pi^2 a}{T}$

(C) $\frac{\pi a\sqrt{3}}{T}$

(D) $\frac{\pi a\sqrt{3}}{2T}$

Q3 Which one of the following equations of motion represents simple harmonic motion? where k, k_0, k_1 and a are all positive.

(A) Acceleration $= -kx + a$

(B) Acceleration $= kx + a$

(C) Acceleration $= kx$

(D) Acceleration $= -k_0 x + k_1 x^2$

Q4 If the displacement (x) and velocity v of a particle executing simple harmonic motion are related through the expression $4v^2 = 25 - x^2$ then its time period is:

(A) π (B) 2π

(C) 4π (D) 6π

Q5 A particle is executing a simple harmonic motion. Its maximum acceleration is α and maximum velocity is β. Then, its time period of vibration will be

(A) β^2/α^2

(B) α/β

(C) β^2/α

(D) $2\pi\beta/\alpha$

Q6 The potential energy of a particle executing SHM varies sinusoidally with frequency f. The frequency of oscillation of the particle will be

(A) $\frac{f}{2}$

(B) $\frac{f}{\sqrt{2}}$

(C) f

(D) $2f$

Q7 The potential energy of a simple harmonic oscillator when the particle is half way to its end point is where E is the total energy.

(A) $\frac{2}{3}E$

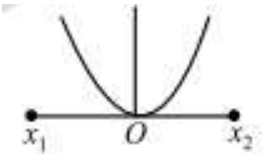
(B) $\frac{1}{8}E$

(C) $\frac{1}{4}E$

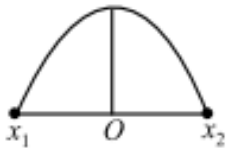
(D) $\frac{1}{2}E$

Q8 A particle of mass m oscillates with simple harmonic motion between points x_1 and x_2, the equilibrium position being O. Its potential energy is plotted. It will be as given below in the graph

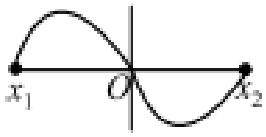
(A)



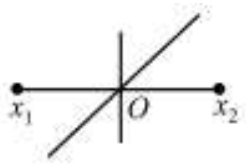
(B)



(C)



(D)



Q9 A body executes simple harmonic motion. The potential energy (P.E.), the kinetic energy (K.E.) and total energy (T.E.) are measured as a function of displacement x. Which of the following statements is true?

(A) P.E. is maximum when $x = 0$

(B) K.E. is maximum when $x = 0$

(C) T.E. is zero when $x = 0$

(D) K.E. is maximum when x is maximum

Q10 A particle of mass m is executing oscillations about the origin on the x-axis. Its potential energy is $U(x) = k|x|^3$, where k is a positive constant. If the amplitude of oscillation is a, then its time period T is

(A) Proportional to $\frac{1}{\sqrt{a}}$

(B) Independent of a

(C) Proportional to $\sqrt{a}$

(D) Proportional to $a^{3/2}$

JEE

Answer Key

Q1	(B)	Q6	(A)
Q2	(C)	Q7	(C)
Q3	(A)	Q8	(A)
Q4	(C)	Q9	(B)
Q5	(D)	Q10	(A)

Android App | iOS App | PW Website