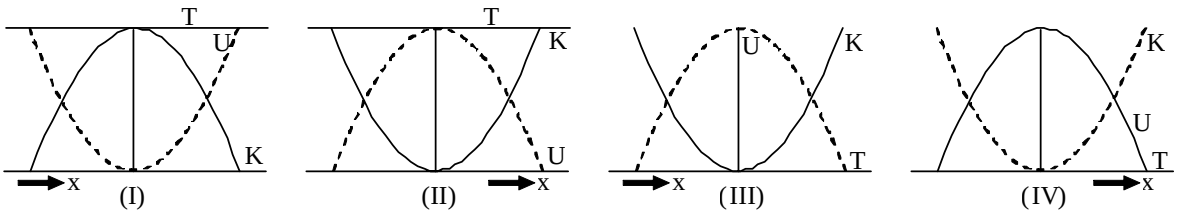
**1.** A particle is performing S.H.M. Its total energy is E. When the displacement of the particle is half of its amplitude, its K.E. will be

(A) E (B) 3 E/4 (C) E/2 (D) E/4

**2.** A particle is executing S.H.M. along a straight line. The graph showing the variation of kinetic, potential and total energy K, U and T respectively with displacement is




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

**3.** Two particles A and B execute simple harmonic motion with periods of T and $\frac{5T}{4}$ respectively . They start simultaneously from mean position. The phase difference between them when A completes one oscillation will be -

(A) 0 (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{2\pi}{5}$

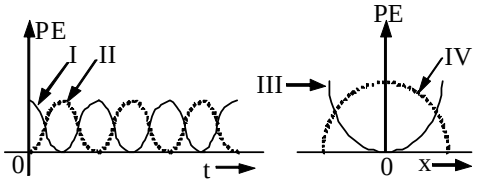
**4.** A simple harmonic oscillator has amplitude 'A' angular frequency $\omega$ and mass m. Then average kinetic energy in one time period is

(A) $\frac{1}{2}m\omega^2A^2$ (B) $\frac{1}{4}m\omega^2A^2$ (C) $m\omega^2A^2$ (D) zero

**5.** A simple pendulum 4 m long swings with an amplitude of 0.2 m. What is its acceleration at the ends of its path ? ($g = 10\ m/s^2$)

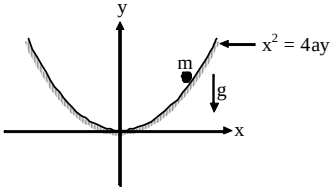
(A) zero (B) 10 $m/s^2$ (C) 0.5 $m/s^2$ (D) 2.5 $m/s^2$

**6.** For a particle executing simple harmonic motion, the displacement x is given by $x = A\cos\omega t$. Identify the graph which represents the variation of potential energy (PE) as a function of time t and displacement x -




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

**7.** A particle of mass m is allowed to oscillate near the minimum point of a vertical parabolic path having the equation $x^2 = 4ay$, then the angular frequency of small oscillations of particle is –




(A) $\sqrt{ga}$ (B) $\sqrt{2ga}$ (C) $\sqrt{\frac{g}{a}}$ (D) $\sqrt{\frac{g}{2a}}$

**8.** A particle is oscillating according to the equation X=7 cos 0.5 πt, where ' t ' is in second. The point moves from the position of equilibrium to maximum displacement in time-

(A) 4.0 second (B) 2 second (C) 1.0 second (D) 0.5 second

**9.** The motion of a particle executing S.H.M. is given by x = 0.01 sin 100π (t + .05), where x is in meters and time is in seconds. The time period is -

(A) 0.01 sec (B) 0.02 sec (C) 0.1 sec (D) 0.2 sec

**10.** The displacement y of a particle executing periodic motion is given by $y = 4\cos^2\left(\frac{t}{2}\right)\sin(1000\ t)$

This expression may be considered to be a result of the superposition of ……independent harmonic motions -

(A) Two (B) Three (C) Four (D) Five

**11.** A particle undergoes simple harmonic motion having time-period T. The time taken 3/8th oscillation is- (Starting from mean position)

(A) (3/8)T (B) (5/8) T (C) (5/12)T (D) (7/12)T

**12.** The velocities of a particle in SHM at positions $x_1$ and $x_2$ are $v_1$ and $v_2$ respectively, its time period will be -

(A) $2\pi\sqrt{(v_1^2 - v_2^2)/(x_2^2 - x_1^2)}$ (B) $2\pi\sqrt{(x_1^2 + x_2^2)/(v_2^2 - v_1^2)}$

(C) $2\pi\sqrt{(x_1^2 - x_2^2)/(v_2^2 - v_1^2)}$ (D) $2\pi\sqrt{(x_1^2 + x_2^2)/(v_2^2 + v_1^2)}$

**13.** For a particle undergoing S.H.M -

(A) Total mechanical energy must be conserved in a round trip

(B) Total mechanical energy must be conserved throughout the motion

(C) Minimum potential energy must correspond maximum kinetic energy

(D) Minimum kinetic energy may correspond maximum potential energy

**14.** A wire is clamped horizontally between two rigid support and a small mass is hanged from middle of the wire. The mass is displaced a little in vertical direction -

(A) Mass will undergo S.H.M for all value of 'x' (large or small)

(B) Mass will not undergo S.H.M for any value of 'x' (large or small)

(C) mass will undergo S.H.M. only if value of 'x' is very small

(D) Mass will undergo periodic motion

**15.** A particle is oscillating with frequency f. Then-(Assume no damping effects)

(A) Its potential energy varies periodically with frequency 2f

(B) Its kinetic energy varies periodically with frequency 2f

(C) Its total mechanical energy (potential energy + kinetic energy) varies periodically with period 4f

(D) Its total mechanical energy is constant with infinite period

# Answers

## RACE # 62

**1.** (B) **2.** (A) **3.** (D) **4.** (B) **5.** (C) **6.** (A) **7.** (D) **8.** (C) **9.** (B) **10.** (B)
**11.** (C) **12.** (C) **13.** (AD) **14.** (BD) **15.** (ABD)