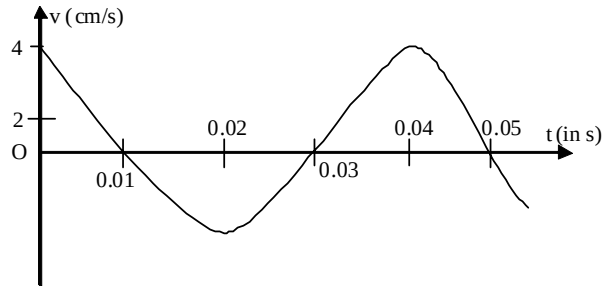
1. A particle of mass 10 gm is executing simple harmonic motion with amplitude of 0.5 m and periodic time of (π/5) seconds. The maximum value of the force acting on the particle is -

(A) 25 N (B) 5 N (C) 2.5 N (D) 0.5 N

2. A particle moves so that its acceleration **a** is given by **a** = –bx where x is the displacement from the equilibrium position and b is a constant. The period of oscillation is -

(A) $2\pi\sqrt{b}$ (B) $2\pi/\sqrt{b}$ (C) $2\pi/b$ (D) $2\sqrt{\pi/b}$

3. The velocity-time graph of a harmonic oscillator is shown in following figure. The frequency of oscillation is



(A) 25 Hz (B) 50 Hz (C) 12.25 Hz (D) 33.3 Hz

4. Which one of the following does not represent simple harmonic motion ?

(A)y = A sin ωt cosωt (B) y = A sin 2ωt

(C) y = A sin ωt + B cosωt (D) y = A sin$^2\omega$t + A sinωt

where y denotes the instantaneous displacement. A and B are constants and ω is the angular frequency

5. The displacement of a particle in simple harmonic motion in one time period is –

(A) A (B) 2A (C) 4A (D) zero

6. The distance moved by a particle in simple harmonic motion in one time period is –

(A) A (B) 2A (C) 4A (D) zero

7. The time period of a particle in simple harmonic motion is equal to the smallest time between the particle acquiring a particular velocity $\vec{v}$. The value of v is –

(A) v_{max} (B) 0

(C) between 0 and v_{max} (D) between 0 and – v_{max}

8. Which of the following quantities are always positive in a simple harmonic motion ?

(A) $\vec{F}.\vec{a}$ (B) $\vec{v}.\vec{r}$ (C) $\vec{a}.\vec{r}$ (D) $\vec{F}.\vec{r}$

9. A particle moves such that its acceleration is given by $a = -\beta(x - 2)$

Here :β is a positive constant and x is the position from origin. Time period of oscillations is -

(A) $2\pi\sqrt{\beta}$ (B) $2\pi\sqrt{\frac{1}{\beta}}$ (C) $2\pi\sqrt{\beta+2}$ (D) $2\pi\sqrt{\frac{1}{\beta+2}}$

10. If a simple harmonic motion is represented by $\frac{d^2x}{dt^2}+\alpha x = 0$, its time period is -

(A) $\frac{2\pi}{\alpha}$ (B) $\frac{2\pi}{\sqrt{\alpha}}$ (C) $2\pi\alpha$ (D) $2\pi\sqrt{\alpha}$

11. 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

12. A body of mass 1 kg is executing simple harmonic motion. Its displacement x (in cm) at time t (in second) is given by, $x = 6 \sin\left(100t+\frac{\pi}{4}\right)$

The maximum kinetic energy of the body is -

(A) 6 J (B) 18 J (C) 24 J (D) 36 J

13. A SHM is given by $y = (\sin \omega t + \cos\omega t)$. Which of the following statement are true-

(A) The amplitude is 1m

(B) The amplitude is $\sqrt{2}$ m

(C) When t = 0, the displacement is 0 m

(D) When t = 0, the displacement is 1 m

14. Which of the following quantities are always zero in a simple harmonic motion ?

(A) $\vec{F}\times\vec{a}$ (B) $\vec{v}\times\vec{r}$ (C) $\vec{a}\times\vec{r}$ (D) $\vec{F}\times\vec{r}$

Paragraph Question 15 to 17

A particle of mass 0.5 kg experiences a force $F = -4x$ and it executes SHM of amplitude 2m. If total mechanical energy of particle is 10 J and its's acceleration at t = 0 is $-16 m/s^2$ then –

15. Potential energy of particle at mean position is

(A) 10 J (B) 8 J (C) 6 J (D) 2J

16. Displacement-time equation of the particle is -

(A) $x = 2 \sin 2t$ (B) $x = 2 \cos 2t$ (C) $x = 2 \sin(2\sqrt{2})t$ (D) $x = 2 \cos(2\sqrt{2})t$

17. At x = +1m, potential energy and kinetic energy of particles are -

(A) 2 J and8 J (B) 8 J and 2 J (C) 6 J and 4 J (D) 4 J and 6 J

Answers

RACE # 61

1. (D) **2.** (B) **3.** (A) **4.** (D) **5.** (D) **6.** (C) **7.** (D) **8.** (A) **9.** (B) **10.** (B)
11. (C) **12.** (B) **13.** (BD) **14.** (ABCD) **15.** (D) **16.** (D) **17.** (D)