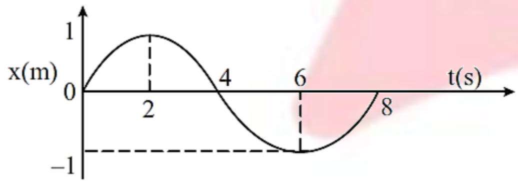
1. If $x = 5\sin\left(\pi t + \frac{\pi}{3}\right) m$ represent the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively are. **(2024)**
(a) 5 m, 2 s (b) 5 cm, 1 s
(c) 5 m, 1 s (d) 5 cm, 2 s

2. If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is $\frac{x}{2}$ times its original time period. Then the value of x is. **(2024)**
(a) $\sqrt{2}$ (b) $2\sqrt{3}$
(c) 4 (d) $\sqrt{3}$

3. The x–t graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at t = 2 s is: **(2023)**



(a) $-\frac{\pi^2}{16} ms^{-2}$ (b) $\frac{\pi^2}{8} ms^{-2}$
(c) $-\frac{\pi^2}{8} ms^{-2}$ (d) $\frac{\pi^2}{16} ms^{-2}$

4. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is. **(2022)**
(a) 9 (b) 10
(c) 8 (d) 11

5. A body is executing simple harmonic motion with frequency 'n', the frequency of its potential energy is: **(2021)**
(a) 2n (b) 3n
(c) 4n (d) n

6. A spring is stretched by 5 cm by a force 10 N. The time period of the oscillations when a mass of 2 kg is suspended by it is: **(2021)**
(a) 6.28 s (b) 3.14 s
(c) 0.628 s (d) 0.0628 s

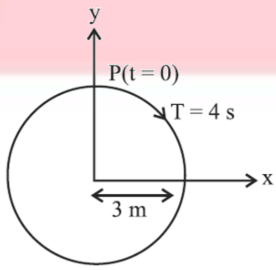
7. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is: **(2020)**
(a) $\frac{3\pi}{2}$ rad (b) $\frac{\pi}{2}$ rad
(c) Zero (d) π rad

8. Identify the function which represents a periodic motion. **(2020 Covid Re-NEET)**
(a) $\log_e(\omega t)$ (b) $\sin\omega t + \cos\omega t$
(c) $e^{-\omega t}$ (d) $e^{\omega t}$

9. 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: **(2019)**
(a) $A_0 + \sqrt{A^2 + B^2}$ (b) $\sqrt{A^2 + B^2}$
(c) $\sqrt{A_0^2 + (A+B)^2}$ (d) $A + B$

10. Average velocity of a particle executing SHM in one complete vibration is: **(2019)**
(a) $\frac{A\omega}{2}$ (b) $A\omega$
(c) $\frac{A\omega^2}{2}$ (d) Zero

11. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the



y-projection of the radius vector of rotating particle P is: **(2019)**
(a) $y(t) = -3\cos 2\pi t$, where y in m
(b) $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, where y in m
(c) $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, where y in m
(d) $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, where y in m

12. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is $20\, m/s^2$ at a distance of 5 m from the mean position. The time period of oscillation is: **(2018)**

(a) 2s (b) π s

(c) 2π s (d) 1 s

13. A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is: **(2017-Delhi)**

(a) $\frac{\sqrt{5}}{2\pi}$ (b) $\frac{4\pi}{\sqrt{5}}$

(c) $\frac{2\pi}{\sqrt{3}}$ (d) $\frac{\sqrt{5}}{\pi}$

14. When two displacements represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ are superimposed, the motion is: **(2015)**

(a) Simple harmonic with amplitude $\frac{a}{b}$

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

(c) Simple harmonic with amplitude $\frac{(a+b)}{2}$

(d) Not a simple harmonic

15. A particle is executing S.H.M. along a straight line. Its velocities at distances x_1 and x_2 from the mean position are V_1 and V_2 respectively. Its time period is: **(2015)**

(a) $2\pi\sqrt{\frac{x_2^2-x_1^2}{V_1^2-V_2^2}}$ (b) $2\pi\sqrt{\frac{V_1^2-V_2^2}{x_1^2+x_2^2}}$

(c) $\sqrt{\frac{V_1^2-V_2^2}{x_1^2-x_2^2}}$ (d) $2\pi\sqrt{\frac{x_1^2+x_2^2}{V_1^2-V_2^2}}$

16. A string is stretched between fixed points separated by 75.0 cm. It is observed to have resonant frequencies of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. The lowest resonant frequencies for this string is: **(2015 Re)**

(a) 105 Hz (b) 155 Hz

(c) 205 Hz (d) 10.5 Hz

17. 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: **(2015 Re)**

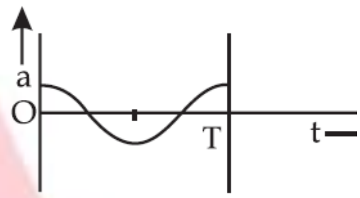
(a) $\frac{2\pi\beta}{\alpha}$ (b) $\frac{\beta^2}{\alpha^2}$

(c) $\frac{\alpha}{\beta}$ (d) $\frac{\beta^2}{\alpha}$

18. The oscillation of a body on a smooth horizontal surface is represented by the equation, $X = A\cos(\omega t)$ where, X = displacement at time t, ω = frequency of oscillation.

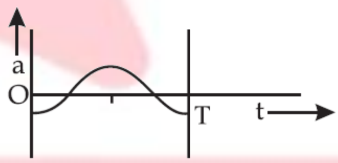
Which one of the following graphs shows correctly the variation a with t? **(2014)**

(a)



(b)

(c)



(d)

Here a = acceleration at time t

T = time period