1.

A partricle 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)2πβ/α

2.

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)$T/\sqrt{2}$

(c) 2T (d) $\sqrt{2}T$

3.

A simple pendulum performs simple harmonic motion about x=0 with an amplitude a and time period *T*. The speed of the pendulum at $x=\frac{a}{2}$ will be -

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

(c) $\frac{3\pi^2 a}{T}$ (d) $\frac{\pi a\sqrt{3}}{T}$

4.

Two simple harmonic motions of angular frequency 100 and 1000 rad s^{-1} have the same displacement amplitude. The ratio of their maximum acceleration is -

(a) 1:10 (b) $1:10^2$

(c) $1:10^3$ (d) $1:10^4$

5.

The displacement of a particle moving in S.H.M. at any instant is given by $y=a\ \sin\omega t$. The acceleration after time $t=\frac{T}{4}$ (where *T* is the time period) -

(a) $a\omega$ (b) $-a\omega$

(c) $a\omega^2$ (d) $-a\omega^2$

6.

A particle executes simple harmonic motion along a straight line with an amplitude *A*. The potential energy is maximum when the displacement is

(a) $\pm A$ (b) Zero

(c) $\pm\frac{A}{2}$ (d) $\pm\frac{A}{\sqrt{2}}$

7.

The potential energy of a particle with displacement *X* depends as *U(X)*. The motion is simple harmonic, when (*K* is a positive constant)

(a) $U=\frac{KX^2}{2}$ (b) $U=KX^2$

(c) $U=K$ (d) $U=KX$

8.

A simple pendulum is set up in a trolley which moves to the right with an acceleration *a* on a horizontal plane. Then the thread of the pendulum in the mean position makes an angle θ with the vertical

(a) $\tan^{-1}\left(\frac{a}{g}\right)$ in the forward direction

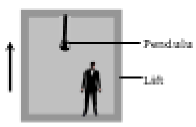
(b) $\tan^{-1}\left(\frac{a}{g}\right)$ in the upward direction

(c) $\tan^{-1}\left(\frac{a}{g}\right)$ in the backward direction

(d) $\tan^{-1}\left(\frac{g}{a}\right)$ in the forward directions

9.

A man measures the period of a simple pendulum inside a stationary lift and finds it to be *T* sec. If the lift accelerates upwards with an acceleration $g/4$, then the period of the pendulum will be



(a) T

(b) $\frac{T}{4}$

(c) $\frac{2T}{\sqrt{5}}$

(d) $2T\sqrt{5}$

10.

The total energy of a particle, executing simple harmonic motion is

(a) $\propto x$ (b) $\propto x^2$

(c) Independent of x (d) $\propto x^{1/2}$

11.

A simple pendulum is suspended from the roof of a trolley which moves in a horizontal direction with an acceleration a, then the time period is given by $\mathrm{T}=2\pi\sqrt{\frac{1}{\mathrm{g}'}}$, where g' is equal to

(a) g

(b) g-a

(c) g+a

(d) $\sqrt{\mathrm{g}^2+\mathrm{a}^2}$

12.

If the length of second's pendulum is decreased by 2%, how many seconds it will lose per day

(a) 3927 sec

(b) 3727 sec

(c) 3427 sec

(d) 864 sec

13.

The bob of a pendulum of length *l* is pulled aside from its equilibrium position through an angle θ and then released. The bob will then pass through its equilibrium position with a speed *v*, where *v* equals

(a) $\sqrt{2\,\mathrm{gl}(1-\sin\theta)}$

(b) $\sqrt{2\,\mathrm{gl}(1+\cos\theta)}$

(c) $\sqrt{2\,\mathrm{gl}(1-\cos\theta)}$

(d) $\sqrt{2\,\mathrm{gl}(1+\sin\theta)}$

14.

A body is executing Simple Harmonic Motion. At a displacement *x* its potential energy is E_1 and at a displacement *y* its potential energy is E_2. The potential energy *E* at displacement $(x+y)$ is

(a) $E=\sqrt{E_1}+\sqrt{E_2}$ (b) $\sqrt{E}=\sqrt{E_1}+\sqrt{E_2}$

(c) $E=E_1+E_2$ (d) $E=E_1+E_2$

15.

In a simple pendulum, the period of oscillation *T* is related to length of the pendulum *l* as

(a) $\frac{1}{T}$=constant

(b) $\frac{l^2}{T}$=constant

(c) $\frac{1}{T^2}$=constant

(d) $\frac{l^2}{T^2}$=constant

16.

The kinetic energy of a particle executing S.H.M. is 16 *J* when it is in its mean position. If the amplitude of oscillations is 25 *cm* and the mass of the particle is 5.12 *kg*, the time period of its oscillation is -

(a) $\frac{\pi}{5} sec$ (b) 2π sec

(c) 20π sec (d) 5π sec

17.

A pendulum has time period *T*. If it is taken on to another planet having acceleration due to gravity half and mass 9 times that of the earth then its time period on the other planet will be

(a) $\sqrt{\mathrm{T}}$

(b) T

(c) $\mathrm{T}^{1/3}$

(d) $\sqrt{2}$T

18.

A particle in SHM is described by the displacement equation $x(t)= A\cos\ (\omega t+\theta).\ If\ the\ initial$ position of the particle is 1 *cm* and its initial velocity is *πcm/s*, what is its amplitude? (The angular frequency of the particle is $\pi\ s^{-1}$)

(a) 1 *cm* (b) $\sqrt{2}$ *cm*

(c) 2 *cm* (d) 2.5 *cm*

19.

A simple pendulum hanging from the ceiling of a stationary lift has a time period T_1. When the lift moves downward with constant velocity, the time period is T_2, then

(a) T_2 is infinity

(b) $\mathrm{T}_2>\mathrm{T}_1$

(c) $\mathrm{T}_2<\mathrm{T}_1$

(d) $\mathrm{T}_2=\mathrm{T}_1$

20.

If the length of a pendulum is made 9 times and mass of the bob is made 4 times , then the value of time period becomes

(a) 3T

(b) 3/2T

(c) 4T

(d) 2T

21.

A simple harmonic wave having an amplitude a and time period T is represented by the equation $y = 5\,\sin\pi(t+4)\text{m}$ Then the value of amplitude (a) in (m) and time period (T) in second are

(a) $a = 10,\ T = 2$ (b) $a = 5,\ T = 1$

(c) $a = 10,\ T = 1$ (d) $a = 5,\ T = 2$

22.

The period of a simple pendulum measured inside a stationary lift is found to be T. If the lift starts accelerating upwards with acceleration of g/3 then the time period of the pendulum is

(a) $\frac{\text{T}}{\sqrt{3}}$

(b) $\frac{\text{T}}{3}$

(c) $\frac{\sqrt{3}}{2}\text{T}$

(d) $\sqrt{3}\text{T}$

23.

The time period of a simple pendulum of length L as measured in an elevator descending with acceleration $\frac{\text{g}}{3}$ is

(a) $2\pi\sqrt{\frac{3\text{L}}{\text{g}}}$

(b) $\pi\sqrt{\left(\frac{3\text{L}}{\text{g}}\right)}$

(c) $2\pi\sqrt{\left(\frac{3\text{L}}{2\text{g}}\right)}$

(d) $2\pi\sqrt{\frac{2\text{L}}{3\text{g}}}$

24.

If a body is released into a tunnel dug across the diameter of earth, it executes simple harmonic motion with time period

(a) $\text{T} = 2\pi\sqrt{\frac{\text{R}_\text{e}}{\text{g}}}$

(b) $\text{T} = 2\pi\sqrt{\frac{2\text{R}_\text{e}}{\text{g}}}$

(c) $\text{T} = 2\pi\sqrt{\frac{\text{R}_\text{e}}{2\text{g}}}$

(d) T=2 seconds

25.

The displacement of a particle varies according to the relation $x = 4(\cos p\pi t + \sin p\pi t)$. The amplitude of the particle is

(a) 8

(b) -4

(c) 4

(d) $4\sqrt{2}$

26.

Amplitude of a wave is represented by

$A = \frac{c}{a+b-c}$

Then resonance will occur when

(a) $b = -c/2$ (b) b = 0 and a = c

(c) $b = -a/2$ *(d)* *None of these*

27.

The metallic bob of a simple pendulum has the relative density ρ. The time period of this pendulum is T. If the metallic bob is immersed in water, then the new time period is given by

(a) $T\frac{\rho-1}{\rho}$ (b) $T\frac{\rho}{\rho-1}$

(c) $T\sqrt{\frac{\rho-1}{\rho}}$ (d) $T\sqrt{\frac{\rho}{\rho-1}}$

28.

The period of oscillation of a simple pendulum of length L suspended from the roof of a vehicle which moves without friction down an inclined plane of inclination a, is given by -

(a) $2\pi\sqrt{\frac{\text{L}}{\text{g cos a}}}$ (b) $2\pi\sqrt{\frac{\text{L}}{\text{g sin a}}}$

(c) $2\pi\sqrt{\frac{\text{L}}{\text{g}}}$ (d) $2\pi\sqrt{\frac{\text{L}}{\text{g tan a}}}$

29.

An ideal spring with spring-constant K is hung from the ceiling and a block of mass M is attached to its lower end. The mass is released with the spring initially unstretched. Then the maximum extension in the spring is -

(a) 4 Mg/K (b) 2 Mg/K

(c) Mg/K (d) $Mg/2K$

30.

Three masses 700g, 500g, and 400g

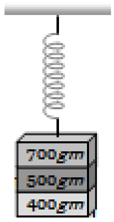
are suspended at the end of a spring a shown and are in equilibrium. When the 700*g* mass is removed, the system oscillates with a period of 3 seconds, when the 500 *gm* mass is also removed, it will oscillate with a period of

(a) 1 *s*

(b) 2 s

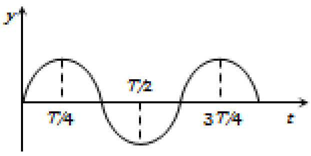
(c) 3 s

(d) $\sqrt{\frac{12}{5}}\,s$



31.

The graph shows the variation of displacement of a particle executing S.H.M. with time. We infer from this graph that -



(a) The force is zero at time T/8

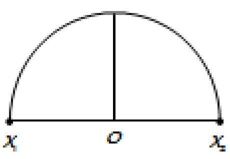
(b) The velocity is maximum at time T/4

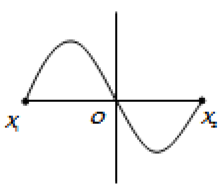
(c) The acceleration is maximum at time *T*

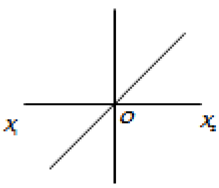
(d) The P.E. is equal to total energy at time T/4

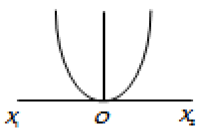
32.

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) 

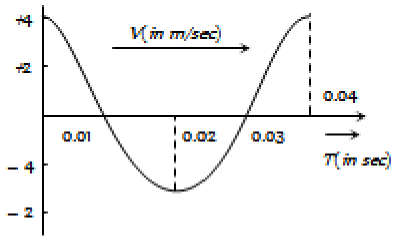
(b) 

(c) 

(d) 

33.

The velocity-time diagram of a harmonic oscillator is shown in the adjoining figure. The frequency of oscillation is

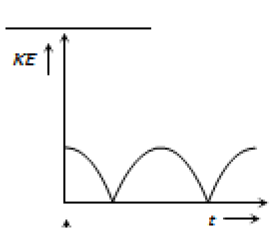


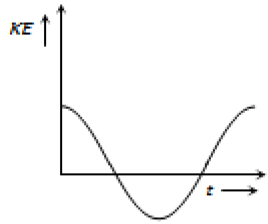
(a) 25 *Hz* (b) 50 *Hz*

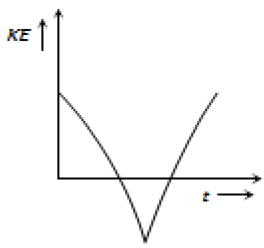
(c) 12.25 Hz *(d) 33.3 Hz*

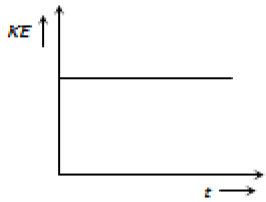
34.

A body performs S.H.M. . Its kinetic energy *K* varies with time *t* as indicated by graph

(a) 

(b) 

(c) 

(d) 

35.

Two simple pendulums of length 0.5 m and 2.0 m respectively are given small linear displacement in one direction at the same time. They will again be in the same phase when the pendulum of shorter length has completed oscillations

1. 5

2. 1

3. 2

4. 3

36.

The time period of a simple pendulum is 2 s. If its length is increased by 4 times, then its period becomes

1. 16 s

2. 12 s

3. 8 s

4. 4 s

37.

Displacement between the maximum potential energy (PE) position and the maximum kinetic energy (KE) position for a particle with amplitude 'a' executing simple harmonic motion is

1. $\pm\frac{a}{2}$

2. $\pm a$

3. $\pm 2a$

4. ± 1

38.

Which one of the following statements is true for the speed 'v' and the acceleration 'a' of a particle executing simple harmonic motion?

1. Value of a is zero, whatever may be value of 'v'.

2. When 'v' is zero, a is zero.

3. When 'v' is maximum, a is zero

4. When 'v' is maximum, a is maximum.

39.

A particle executing simple harmonic motion of amplitude 5 cm has a maximum speed of 31.4 cm s^{-1}. The frequency of its oscillation is

1. 1Hz

2. 3Hz

3. 2Hz

4. 4HZ

40.

The circular motion of a particle with constant speed is

1. periodic and simple harmonic

2. simple harmonic but not periodic

3. neither periodic nor simple harmonic

4. periodic but not simple harmonic

41.

The particle executing simple harmonic motion has a kinetic energy $K_0 \cos^2 \omega t$. The maximum values of the potential energy and are the total energy respectively.

1. $K_0/2$ and K_0

2. K_0 and $2K_0$

3. K_0 and K_0

4. 0 and $2K_0$

42.

The displacement of a particle along the x-axis is given by x= $a\sin^2 \omega t$. The motion of the particle corresponds to

1. simple harmonic motion of frequency $\frac{\omega}{2\pi}$

2. simple harmonic motion of frequency $\frac{\omega}{\pi}$

3. simple harmonic motion of frequency $\frac{3\omega}{2\pi}$

4. non simple harmonic motion.

43.

Two particles are oscillating along two close parallel straight lines side by side, with the same frequency and amplitudes. They pass each other, moving in opposite directions when their displacement is half of the amplitude. The mean position of the two particles lies on a straight line perpendicular to the paths of the two particles. The phase difference is -

1. $\frac{\pi}{6}$

2. 0

3. $\frac{2\pi}{3}$

4. π

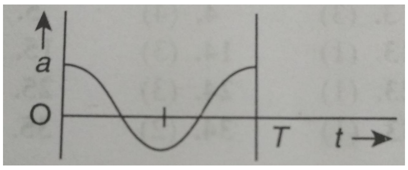
44.

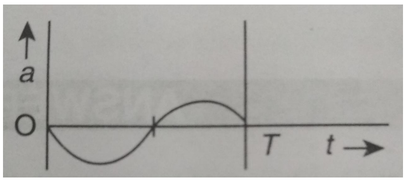
The oscillation of a body on a smooth horizontal surface is represented by the equation.

$$x = A \cos(\omega t)$$

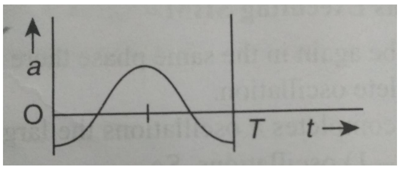
where x=displacement at time t, ω=frequency of oscillation.

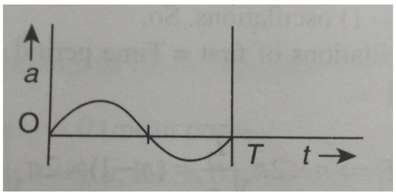
Which one of the following graph shows correctly the variation of acceleration 'a' with 't'?

1. 

2. 

3.



4. 

45.

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

1. $\frac{\sqrt{5}}{2\pi}$
2. $\frac{4\pi}{\sqrt{5}}$
3. $\frac{2\pi}{\sqrt{3}}$
4. $\frac{\sqrt{5}}{\pi}$

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