PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

OSCILLATIONS

MCQ

1. In the differl equation $\frac{d^2x}{dt^2} + \omega^2 x = 0$, for a simple harmonic motion, the termω^2 represents

A. restoring force per unit mass

B. restoring force per unit displacement

C. restoring force per unit mass per unit displacement

D. acceleration per unit mass per unit displacemnet

Answer: C

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2. The physical qunnity whose SI unit is the same as that of the force constant is

A. pressure

B. surface tension

C. potential energy

D. torque

Answer: B

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3. A particle moving along the X-axis executes simple harmonic motion, then the force acting on it is given by where, A and K are positive constants.

A. F=A "cos" (Ky)

B. F= A "sin" (Ky)

C. F= - A Ky

D. F = A Ky

Answer: C

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4. The equation of displacement of a harmonic oscillator is x $=3\sin\omega t+4\cos\omega t$ amplitude is

A. 2

B. 5

C. 7

D. 12

Answer: B

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5. The displacement of a particle varies with time according to the relation $y = a\sin\omega t + b\cos\omega t.$

A. it is an oscillatory motion but not a SHM

B. it is a SHM of amplitude A

C. it is a SHM of amplitude 2A

D. it is a SHM of amplitude $A\sqrt{2}$

Answer: D

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6. Two simple harmonic motions are represented as $y_1 = 10\sin\omega$ and $y_2 = 5\sin\omega t + 5\cos\omega t$

The ration of the amplitudes of y_1 and y_2 is

A. $1:1$

B. $1:\sqrt{2}$

C. $\sqrt{2}:1$

D. $1:4$

Answer: C

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7. The restoring force F acting on a particle of mass (m) executing a S. H. M. is given by F= -Kx, where x is the displacement and K is a constant. Then the angular velocity of the particle is given by

A. $\sqrt{\frac{m}{K}}$

B. $\sqrt{\frac{K}{m}}$

C. mK

D. $\sqrt{mK}$

Answer: B

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8. When a particle performs a U.C.M. of diameter 10cm, its projection along the diameter of the circle, performs a S.H.M. of amplitude

A. 10 cm

B. 5 cm

C. 20 cm

D. 2.5 cm

Answer: B

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9. The frequency of a particle performing a linear S.H.M is $\frac{5}{2\pi}$ Hz. The differential equation of S.H.M. is

A. $\frac{d^2x}{dt^2} + 16x = 0$

B. $\frac{d^2x}{dt^2} + 25x = 0$

C. $\frac{d^2x}{dt^2} + 15x^2 = 0$

D. $\frac{d^2x}{dt^2} + 10x = 0$

Answer: B

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10. Which one of the following statements about a linear S.H.M. is false ?

A. It is periodic motion

B. Acceleration of the particle is directed towards the extreme position

C. The body moves about the mean position along a straight line

D. Velocity is zero at the extreme position

Answer: B

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11. A particle executes a simple harmonic motion of amplitude 1.0 cm along the principle axis of a convex lens of focal length 12 cm. The mean position of oscillation is at 20 cm from the lens. Find the lens amplitude of oscillation of image of the particle. Does the image also execute simple harmonic motion ?

A. 1.5 cm

B. 2.3 cm

C. 2.8 cm

D. 3.2 cm

Answer: B

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12. The function $\sin^2(\omega t)$ represents:

A. a periodic, but not a simple harmonic motion with a period π / ω

B. a simple harmonic motion with a period $2\pi / \omega$

C. a simple harmonic motion with a period π / ω

D. a periodic, but not simple harmonic motion with a period $2\pi / \omega$

Answer: A

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13. The displacement of a particle varies with time according to the relation $y = a \sin \omega t + b \cos \omega t$.

A. The motion is oscillatory but not SHM

B. The motion is SHM with an amplitude a+b

C. The motion is SHM with an amplitude $a^2 + b^2$

D. The motion is SHM with an amplitude $\sqrt{a^2 + b^2}$

Answer: D

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14. If the particle in linear S.H.M. starts from the extreme left position, then its equation of motion is given by

A. $x = A\sin(\omega t + \pi/2)$

B. $x = A\sin(\omega t - \pi/2)$

C. $x = -A\sin(\omega t + \pi/2)$

D. $x = A\cos\omega t$

Answer: B

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15. For a simple harmonic oscillator, the aceeleration is $3m/s^2$ when the displacement is 0.03 m. The angular frequency of the oscillator is

A. $1 rad/s$

B. $0.1 rad/s$

C. $10 rad/s$

D. $100 rad/s$

Answer: C

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16. A particle executes a linear S.H.M. of amplitude 8 cm and period 2s. The magnitude of its maximum velocity is

A. 8π cm/second

B. 16π cm/second

C. 4π cm/second

D. 2π cm/second

Answer: A

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17. A particle moves in such a way that its acceleration a= -bx, where x is its displacement from the mean position and b is a constant. The period of its oscillation is

A. $2\pi b$

B. $\frac{2\pi}{b}$

C. $\frac{2\pi}{\sqrt{b}}$

D. $2\pi\sqrt{b}$

Answer: C

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18. A particle perfoms a S.H.M. of amplitude A and period T. It the particle is half way between the mean position and the extreme position, then its speed at that point will be

A. $\frac{\pi A\sqrt{3}}{T}$

B. $\frac{3\pi^2 A}{T}$

C. $\frac{\pi A}{T}$

D. $\frac{\pi A\sqrt{3}}{2T}$

Answer: A

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19. A body performs a S.H.M. of amplitude a. If the speed of the particle is half of its maximum speed, then the displacement of the particle is

A. $\frac{a}{2}$

B. $\frac{\sqrt{3}}{2}a$

C. a

D. 2a

Answer: B

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20. For a particle performing linear SHM, its average speed over one oscillation is (where, a= amplitude of SHM, n=frequency of oscillation)

A. $\frac{A\omega}{\pi}$

B. $\frac{2A\omega}{\pi}$

C. Zero

D. $\dfrac{2\pi}{A\omega}$

Answer: B

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21. The differential equation of a particle performing a S.H.M. is $\dfrac{d^2x}{dt^2} + 64x = 0$. The period of oscillation of the particle is

A. 10 sec

B. 5 sec

C. $\dfrac{\pi}{3}$ sec

D. $\frac{\pi}{4}$ sec

Answer: D

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22. For a linear harmonic oscillator, period is π second and amplitude is 5 cm. The velocity of the oscillator, when it is at a dis"tan"ce of 1 cm from the extreme position is

A. $6cm / s$

B. $5cm / s$

C. $4cm / s$

D. $3cm / s$

Answer: A

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23. In a S.H.M., the path length is 4 cm and the maximum acceleration is $2\pi^2 cm / s^2$. The periodic time of S.H.M. is

A. $\frac{1}{2}s$

B. $\frac{1}{4}s$

C. 2 s

D. 4 s

Answer: C

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24. The maximum velocity and the maximum acceleration of a body moving in a simple harmonic oscillator are 2 m/s and $4m / s^2$. Then angular velocity will be

A. 4 rad/s

B. 3 rad/s

C. 2 rad/s

D. 1 rad/s

Answer: C

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25. A particle executes a S.H.M. of amplitude A and maximum velocity V_m then its speed at displacement $A/2$ is

A. $\frac{V_{\max}}{2}$

B. $\frac{V_{\max}}{4}$

C. $V_{\max}$

D. $0.866V_{\max}$

Answer: D

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26. The amplitude and the time period in a S.H.M. is 0.5 cm and 0.4 sec respectively. If the initial phase is $\pi / 2$ radian, then the equation of S.H.M. will be

A. $y = 0.5\sin(5\pi t)$

B. $y = 0.5\cos(5\pi t)$

C. $y = 0.5\sin(2.5\pi t)$

D. $y = 0.5\cos(2.5\pi t)$

Answer: B

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27. A body of mass 1 gram executes a linear S.H.M. of period 1.57 s. If its maximum velocity is 0.8 m/s, then its maximum displacement from the mean position is

A. 10 cm

B. 20 cm

C. 30 cm

D. 40 cm

Answer: B

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28. The displacement of a particle performing a S.H.M is given by x=0.25 "cos" $\left[8\pi t + \frac{\pi}{3}\right]$. The frequency of S.H.M. is

A. 2 Hz

B. 4 Hz

C. 6 Hz

D. 8 Hz

Answer: B

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29. A linear harmonic oscillator starts from rest at time t=0. After time t=2 seconds, it again comes to rest, at a dis"tan"ce of 2 cm. The amplitude and period of the harmonic oscillator are given by

A. 2 cm, 2 seconds

B. 1 cm, 4 seconds

C. 2 cm, 4 seconds

D. 1 cm, 2 seconds

Answer: B

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30. The displacment of particle performing a linear S.H.M. is given by $x = 5\sin(8\pi + \pi / 3)$, where x is in metre and t is in second. The frequency and period of S.H.M. are given by

A. 4 Hz, 0.5 sec

B. 2 Hz, 0.25 sec

C. 4 Hz, 0.25 sec

D. 4 Hz, 0.75 sec

Answer: C

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31. A particle performs a linear S.H.M. of period 3 second. The time taken by the particle to cover a dis"tan"ce equal to half the amplitude, from the mean position is

A. $1/2$ second

B. $1/4$ second

C. $3/4$ second

D. 1 second

Answer: B

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32. The acceleration of a particle performing a linear S.H.M. is $16cm / s^2$, when it is at a dis"tan"ce of 4 cm from the mean position. The period of S.H.M. is

A. 6.28 sec

B. 1.57 sec

C. 5 sec

D. 3.14 sec

Answer: D

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33. A particle performs a S.H.M. of amplitude 10 cm and period 12s. What is the speed of the particle 3s, after pas"sin"g through its mean position ?

A. 5 cm/s

B. 10 cm/s

C. Zero

D. 7.5 cm/s

Answer: C

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34. A particle executes a linear S.H.M. of amplitude A and period T. It starts from the mean position. The time required to cover a dis"tan"ce A/2 is

A. $\frac{T}{4}$

B. $\frac{T}{3}$

C. $\frac{T}{8}$

D. $\frac{T}{12}$

Answer: D

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35. The maximum speed of a particle performing a linear S.H.M. is 0.16 m/s and the maximum acceleration is 0.64 m / s^2. The period of S.H.M. is

A. 1 second

B. 2 second

C. 1.57 second

D. 3.57 second

Answer: C

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36. The maximum displacement of a particle executing a linear S.H.M. is 5 cm and its periodic time is 2 sec. If it starts from the mean position then the equation of its displacement is given by

A. $x = 5\sin 2\pi t$

B. $x = 5\sin \pi t$

C. $x = 10\sin 3\pi t$

D. $x = 5\sin\left(\frac{\pi}{2}t\right)$

Answer: B

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37. The displacement at an ins"tan"t t, of a particle executing a linear S.H.M. is given by x=5 "sin" 31.4(t+0.1). Its periodic time is

A. 2 sec

B. 0.2 sec

C. 0.5 sec

D. 1 sec

Answer: B

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38. The amplitude of oscillation of a particle executing a linear S.H.M. is $\frac{5}{\pi^2}$ cm, If its frequency is 20 Hz, then the magnitude of its maximum acceleration will be

A. $20m/s^2$

B. $40m/s^2$

C. $80m/s^2$

D. $100m/s^2$

Answer: C

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39. The acceleration of a particle performing a S.H.M. is $0.12 m / s^2$, when the particle is at a dis"tan"ce of 3 cm from its equilibrium position. What is the period of S.H.M. ?

A. 3.14 s

B. 6.28 s

C. 1.57 s

D. 10 s

Answer: A

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40. The velocity of a particle executing a S.H.M. of frequency 10 oscillations /sec is $\pi m / s$, when it is at the mean positio, Upto what maximum dis"tan"ce, the particle will be displaced?

A. 2 cm

B. 3 cm

C. 4 cm

D. 5 cm

Answer: D

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41. The maximum acceleration of a body moving is SHM is a_0 and maximum velocity is v_0. The amplitude is given by

A. $\frac{V_{m^2}}{a_m}$

B. $\frac{V_m}{a_m}$

C. $\frac{a_{m^2}}{V_m}$

D. $\frac{a_m}{V_{m^2}}$

Answer: A

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42. What is the displacement of a SHM particle of amplitude 3 cm, where its velocity is $\frac{1}{3}$ of its maximum velocity ?

A. $2\sqrt{2}cm$

B. $\sqrt{2}cm$

C. $3\sqrt{2}cm$

D. $\frac{5}{\sqrt{2}}cm$

Answer: A

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43. The equation of displacement of a particle performing a S.H.M. is x=0.25 "sin" (200 t) metre. What is the maximum velocity of the particle ?

A. $200m/s$

B. $100m/s$

C. $50m/s$

D. $25m/s$

Answer: C

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44. The displacement of a linear simple harmonic oscillator is given by $y = \sin\frac{\pi}{2}\left[\frac{t}{2}+\frac{1}{2}\right]$ cm. The maximum acceleration of the oscillator in cms^{-2} is

A. $\frac{\pi}{4}$

B. $\frac{\pi^2}{4}$

C. $\frac{\pi^2}{8}$

D. $\frac{\pi^2}{16}$

Answer: D

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45. The ins"tan""tan"cous acceleration (a) of a particle executing a linear SHM is given by a = -4x where x is the displacement from the mean position. The period of the particle is given by

A. πs

B. $\frac{\pi}{2} s$

C. $2\pi s$

D. $\frac{\pi}{4}s$

Answer: A

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46. The maximum velocity of a linear simple harmonic oscillator represented by $y = 6\sin(50t + \pi/3)$ is given by [all quantities are in SI units]

A. 100 m/s

B. 300 m/s

C. $6\pi m/s$

D. $\pi / 3m / s$

Answer: B

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47. The frequency of a linear SHM-oscillator is to be doubled. For this the mass should be

A. doubled

B. halved

C. reduced to one fourth of its original value

D. increased to four times

Answer: C

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48. A particle executes a SHM of angular velocity 2 rad/s and maximum acceleration of $8m/s^2$. What is the path length of the oscillator ?

A. 2 m

B. 3 m

C. 4 m

D. 6 m

Answer: C

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49. The instantaneous displacement of a simple pendulum oscillator is given by $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$ Its speed will be maximum at time

A. $t = \frac{\pi}{\omega}$

B. $t = \frac{2\pi}{\omega}$

C. $t = \frac{\pi}{4\omega}$

D. $t = \frac{\omega}{2\pi}$

Answer: C

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50. In a linear S.H.M., the acceleration of the particle is zero, when its velocity is

A. Zero

B. Maximum

C. Half of its maximum value

D. Minimum

Answer: B

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51. The displacement of a particle executing a S.H.M. is given by x= A "sin" $\omega t + A\cos\omega t$. What is the amplitude of motion ?

A. $2A$

B. $\sqrt{2}A$

C. $\sqrt{3}A$

D. A

Answer: B

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52. The maximum velocity of a particle performing a linear S.H.M. of amplitude 1.4 cm is $4.4m/s$. What is the period of S.H.M. ?

A. 0.1 s

B. 0.2 s

C. 2 s

D. 0.02 s

Answer: D

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53. A particle executes a linear S.H.M. given by y= 0.5 "sin" 100 (metre).

Its amplitude and frequency given in cm and hertz are

A. 50 cm and 100 Hz

B. 5 cm and 50 Hz

C. 50 cm and $\frac{50}{\pi} Hz$

D. $0.5 \text{ and } \frac{\pi}{50} Hz$

Answer: C

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54. A body of mass 200 g is executing a S.H.M. of amplitude 50 cm and period 1 s. The magnitude of maximum force acting on the particle is (use $\pi^2 = 10)$

A. 1 N

B. 2 N

C. 3 N

D. 4 N

Answer: D

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55. The equation of motion of a particle executing a linear S.H.M. is given by $x = 10 \sin(4t - \pi / 6) cm$. What is its velocity, when x=6 ?

A. 64 cm/sec

B. 54 cm/sec

C. 32 cm/sec

D. 16 cm/sec

Answer: C

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56. A particle performs a S.H.M. of period 2π sec and amplitude 2 cm. At what dis"tan"ce from the mean position, its velocity and acceleration are numerically equal ?

A. $\sqrt{2}cm$

B. $\sqrt{3}cm$

C. $\sqrt{6}cm$

D. $\sqrt{5}cm$

Answer: A

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57. 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. $T = \frac{2\pi\beta}{\alpha}$

B. $T = \frac{2\pi\alpha}{\beta}$

C. $T = \frac{\beta}{2\pi\alpha}$

D. $T = \frac{\alpha}{2\pi\beta}$

Answer: B

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58. If a body of mass 0.98 kg is made to oscillate on a spring of force constant 4.84 N/m the angular frequency of the body is

A. $\sqrt{2}rad/s$

B. $\sqrt{3}rad/s$

C. $\sqrt{5}rad/s$

D. $\sqrt{7}rad/s$

Answer: C

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59. The periodic time of a particle executing a linear S.H.M. is $\frac{2\pi}{\omega}$. If its velocity at a dis"tan"ce b from the mean position is $\sqrt{3}b\omega$, then the path length of the particle is

A. b

B. 2b

C. 3b

D. 4b

Answer: D

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60. A body is executing S.H.M. when its displacement from the mean position is 4 cm and 5 cm, the corresponding velocity of the body is 10 cm/sec and 8 cm/sec. Then the time period of the body is

A. π sec

B. $\frac{\pi}{2}$ sec

C. $2\pi s$

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

Answer: A

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61. A block rests on a horizontal table which is executing SHM in the horizontal plane with an amplitude A. What will be the frequency of oscillation, the block will just start to slip? Coefficient of friction $= \mu$.

A. $2\pi\sqrt{\frac{A}{\mu g}}$

B. $\frac{1}{2\pi}\sqrt{\frac{\mu g}{A}}$

C. $\frac{2\pi\mu g}{A}$

D. $\frac{1}{4\pi}\sqrt{\frac{\mu g}{A}}$

Answer: B

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62. A partilce is executive simple harmonic motion given by

$x = 5\sin\left(4t - \frac{\pi}{6}\right)$

The velocity of the particle when its displacement is 3 units is

A. $16 cm / s$

B. $\frac{5\pi}{6} cm / s$

C. $20 cm / s$

D. $\frac{2\pi}{3} cm / s$

Answer: A

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63. A particle executes simple harmonic motion with an amplitude of 4 cm . At the mean position the velocity of the particle is 10 cm/ s . The distance of the particle from the mean position when its speed becomes 5 cm/s is

A. $2(\sqrt{3})\,cm$

B. $2(\sqrt{5})\,cm$

C. $\sqrt{5}cm$

D. $\sqrt{3}cm$

Answer: A

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64. The instantaneous displacement of a simple pendulum oscillator is given by $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$Its speed will be maximum at time

A. $\frac{\pi}{2\omega}$

B. $\frac{\pi}{4\omega}$

C. $\frac{2\pi}{\omega}$

D. $\frac{\pi}{\omega}$

Answer: B

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65. The height of a swing changes during its motion from 0.1 m to 2.5 m . The minimum velocity of a boy who swings in this swing is

A. 3.14 m/s

B. Zero

C. 5.4 m/s

D. 4.95 m/s

Answer: B

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66. The maximum velocity for a particle in S.H.M. is 0.16 m/s and the maximum acceleration is $0.64 m / s^2$. The amplitude of S.H.M. is

A. $4 \times 10^{-2} m$

B. $4 \times 10^{-1} m$

C. $4 \times 10^2 m$

D. 4×10^{-3} m

Answer: A

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67. The periodic time of a particle performing a linear S.H.M. is 12 sec. It starts from the mean position. After 2 seconds, its velocity is found to be $\pi cm / \sec$. What is the amplitude of S.H.M. ?

A. 12 cm

B. 18 cm

C. 36 cm

D. 24 cm

Answer: D

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68. A particle is performing a linear S.H.M. of period 24 s. The velocity of the particle is 6.28 m/s after 4 s after cros"sin"g the mean position. What is the amplitude of S.H.M. ?

A. 48 cm

B. 36 cm

C. 24 cm

D. 12 cm

Answer: A

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69. A particle performing SHM has time period $\frac{2\pi}{\sqrt{3}}$ and path lenght 4 cm. The displacement from mean position at which acceleration is equal to velocity is

A. 1 cm

B. 2 cm

C. 3 cm

D. 4 cm

Answer: A

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70. A particle executes a linear S.H.M. of angular velocity 4 rad/s and maximum acceleration of $8m/s^2$. What is its path length ?

A. 0.5 m

B. 0.75 m

C. 1 m

D. 2 m

Answer: C

71. A large horizontal surface moves up and down in SHM with an amplitude of 1 cm . If a mass of 10 kg (which is placed on the surface) is to remain continually in contact with it, the maximum frequency of S.H.M. will be

A. 0.5 Hz

B. 1.5 Hz

C. 5.0 Hz

D. 10.0 Hz

Answer: C

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72. A particle is performing a linear S.H.M. If at time t=0, its displacement is 1 cm, its velocity is $\pi cm / \sec$ and its angular frequency is $\pi rad / s$, then the amplitude of its motions is

A. 1 cm

B. $\sqrt{2} cm$

C. 3 cm

D. πcm

Answer: B

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73. The frequency of the sinusoidal wave

$y = 0.40 \cos[2000t + 0.80x]$ would be

A. $1000\pi Hz$

B. 2000 Hz

C. 20 Hz

D. $\frac{1000}{\pi} Hz$

Answer: D

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74. If a simple harmonic oscillator has got a displacement of $0.02m$ and acceleration equal to $2.0ms^{-2}$ at any time, the angular frequency of the oscillator is equal to

A. 10 rad/s

B. 5 rad/s

C. 1 rad/s

D. 20 rad/s

Answer: A

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75. A partilce is executive simple harmonic motion given by

$$x = 5\sin\left(4t - \frac{\pi}{6}\right)$$

The velocity of the particle when its displacement is 3 units is

A. $6cm/s$

B. $16cm/s$

C. $\frac{2\pi}{3}cm/s$

D. $8cm/s$

Answer: B

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76. The maximum velocity a particle, executing simple harmonic motion with an amplitude 7 mm, 4.4 m//s. The period of oscillation is.

A. 0.1 s

B. 100 s

C. 0.01 s

D. 10 s

Answer: A

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77. The displacement of a particle is represented by the equation

$$y = 0.4\left\{\cos^2\left(\frac{\pi t}{2}\right) - \sin^2\left(\frac{\pi t}{2}\right)\right\}\text{metre}$$

The motion of the particle is

A. a S.H.M. with amplitude 0.8 m

B. oscillatory but not S.H.M.

C. a S.H.M. with amplitude 0.4 m

D. a S.H.M. with amplitude $0.4\sqrt{2}m$

Answer: C

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78. A person normally weighing $60kg$ stands on a platform which oscillates up and down harmonically at a frequency $2.0\sec^{-1}$ and an amplitude $5.0cm$. If a machine on the platform gives the person's weight against time deduce the maximum and minimum reading it will shown, $Take g = 10m/\sec^2$.

A. maximum reading of the machine is 90 kg

B. minimum reading of the machine is zero

C. minimum reading of the machine is 32 kg

D. maximum reading of the machine is 108 kg

Answer: D

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79. Motion of an oscillating liquid column in a U-tube is

A. periodic but not simple harmonic

B. non-periodic

C. simple harmonic and time period is independent of the density of the liquid

D. simple harmonic and time period is directly proportional to the density of the liquid

Answer: C

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80. A particle executes S.H.M. of amplitude 25 cm and time period 3 s. What is the minimum time required for the particle to move between two points 12.5 cm on either side of the mean position ?

A. 0.6 s

B. 0.5 s

C. 0.4 s

D. 0.2 s

Answer: B

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81. The average acceleration of a particle performing SHM over one complete oscillation is

A. $\frac{A\omega^2}{2}$

B. $\frac{A\omega^2}{\sqrt{2}}$

C. $A\omega^2$

D. zero

Answer: D

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82. A linear SHM is represented by $x = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$cm.

What is the amplitude of SHM ?

A. $5\sqrt{2}$

B. 50 cm

C. 10 cm

D. 20 cm

Answer: C

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83. A particle is executing a linear S.H.M. and its differential equation is $\frac{d^2x}{dt^2} + \alpha x = 0$. Its time period of motion is

A. $\frac{2\pi}{\alpha}$

B. $2\pi\alpha$

C. $2\pi\sqrt{\alpha}$

D. $\frac{2\pi}{\sqrt{\alpha}}$

Answer: D

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84. The displacement of a particle in S.H.M. is given by $x = 5[\cos\pi t + \sin\pi t]$ where x is in metre. The amplitude of motion of the particle is given by

A. 8 m

B. 10 m

C. $5\sqrt{2}m$

D. $10\sqrt{2}m$

Answer: C

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85. A small wooden cube is placed on a plank. The plank performs a vertical S.H.M. of frequency $\frac{3}{\pi}Hz$. What is the maximum amplitude of its vertical S.H.M., so that the wooden cube does not leave the plank ? $\left[g = 10m / s^2\right]$

A. $\frac{5}{12}m$

B. $\frac{5}{18}m$

C. $\frac{7}{12}m$

D. $\frac{11}{18}m$

Answer: B

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86. The maximum speed of a particle in SHM is given by $mA = V_m$. The average speed of the particle in terms of maximum speed is given by

A. $\frac{V_m}{2}$

B. $\frac{\pi V_m}{2}$

C. $\frac{2V_m}{\pi}$

D. $\frac{\pi}{2V_m}$

Answer: C

Watch Video Solution

87. The displacements of two linear simple harmonic oscillators are given by $x_1 = 3\sin(100t + \theta)$ and $x_2 = 4\cos(100t)$. What is the phase difference between the velocities of these oscillators ?

A. θ

B. $\theta - \pi / 2$

C. $\theta + \pi / 2$

D. $-\theta$

Answer: B

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88. A particle executes a S.H.M. of amplitude 4 cm and period 4 sec. If at time t=0, the net force acting on the particle is zero, then its velocity at that point is given by

A. $2\pi cm / s$

B. $\pi cm / s$

C. $\pi / 2cm / s$

D. $\frac{3\pi}{4} cm / s$

Answer: A

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89. A spherical marble of radius r is made to oscillate in a bowl of radius R. What is its period of oscillation ?

A. $T = 2\pi\sqrt{\frac{R}{g}}$

B. $T = 2\pi\sqrt{\frac{R-r}{g}}$

C. $T = \frac{1}{2\pi}\sqrt{\frac{g}{R-r}}$

D. $T = 2\pi\sqrt{\frac{g}{R}}$

Answer: B

Watch Video Solution

90. The maximum velocity ad maximum acceleration of a particle performing a linear S.H.M. are α and β

respectively. Then the path length of the particle is

A. $\frac{\alpha(2)}{\beta}$

B. $\frac{\beta}{2\alpha^2}$

C. $\frac{2\alpha^2}{\beta}$

D. $\frac{2\beta}{\alpha^2}$

Answer: C

Watch Video Solution

91. The instantaneous displacement of a simple pendulum oscillator is given by $x = A\cos\left(\omega t + \frac{\pi}{4}\right)$ Its speed will be maximum at time

A. $\frac{2\pi}{\omega}$

B. $\frac{\pi}{4\omega}$

C. $\frac{\pi}{\omega}$

D. $\frac{\pi}{2\omega}$

Answer: B

Watch Video Solution

92. A particle executing a linear S.H.M. performs 1200 oscillations/minute. The velocity at the midpoint of its path is 3.142 m/s. What is its equation of its displacement, if at time t=0, it is in the extreme right position ?

A. $y = 0.025\sin(40\pi t)$

B. $y = 0.05\cos(40\pi t)$

C. $y = 0.025\cos(40\pi t)$

D. $y = 0.025\cos(20\pi t)$

Answer: C

Watch Video Solution

93. A particle is performing simple harmonic motion along $x-$axis with amplitude $4cm$ and time period $1.2\sec$ .The minimum time taken by the particle to move from $x = 2cm \to x = +4cm$ and back again is given by

A. 0.6 s

B. 0.4 s

C. 0.3 s

D. 0.2 s

Answer: B

Watch Video Solution

94. A particle oscillates simple harmonically along a straight line with period 8 seconds and amplitude $8\sqrt{2}$m. It starts from the mean position, then the ratio of the distances travelled by it in the second second and first second of its motion is

A. $\sqrt{2}$

B. 2

C. $\left(\sqrt{2}-1\right)$

D. $\sqrt{3}$

Answer: C

Watch Video Solution

95. A point mass m is suspended at the end of a massless wire of length l and cross section. If Y is the Young's modulus for the wire, obtain the frequency of oscillation for the simple harmonic motion along the vertical line.

A. $\frac{1}{2\pi}\sqrt{\frac{LAm}{Y}}$

B. $\frac{1}{2\pi}\sqrt{\frac{YA}{mL}}$

C. $\frac{1}{2\pi}\sqrt{\frac{mY}{AL}}$

D. $\frac{1}{2\pi}\sqrt{\frac{AL}{mY}}$

Answer: B

Watch Video Solution

96. A particle executes a S.H.M. of amplitude 20 cm and period 3 s. What is the minimum time required by the particle to move between two points 10 cm on eith side of the mean position ?

A. 1 s

B. $\frac{3}{4}s$

C. $\frac{1}{2}s$

D. $\frac{1}{4}s$

Answer: C

Watch Video Solution

97. The displacement of a particle from its mean position (in metre) is given by

$y = 0.2\sin(10\pi t + 1.5\pi)\cos(10\pi t + 1.5\pi)$

The motion of the particle is

A. periodic but not simple harmonic motion

B. non-periodic

C. simple harmonic motion with period of 0.1 s

D. simple harmonic motion with period of 0.2 s

Answer: C

Watch Video Solution

98. A body of mass 0.1 kg is executing a simple harmonic motion of amplitude 0.2 m. When the body passes through the mean position, its kinetic energy is 8×10^{-3} J. The initial phase of oscillation is 60. What is the equation of motion of the body ?

A. $y = 0.2\sin\left(\frac{1}{4} + \frac{\pi}{3}\right)$

B. $y = 0.2\sin\left(4t + \frac{\pi}{3}\right)$

C. $y = 0.2\sin\left(\frac{1}{2} + \frac{\pi}{3}\right)$

D. $y = 0.2\sin\left(4t - \frac{\pi}{3}\right)$

Answer: B

Watch Video Solution

99. Two S.H.M. s are represented by the equation $x_1 = 3\sin\left(2\pi t + \frac{\pi}{4}\right)$ and $x_2 = 3\sqrt{2}[\sin(2\pi t) + \cos(2\pi t)]$

What is the ratio of the amplitudes of x_1 and x_2 ?

A. $2:1$

B. $1:2$

C. $1:3$

D. $\sqrt{3}:1$

Answer: B

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100. A U tube pf uniform born of cross sectional area A has been set up vertically with open ends facing up Now mgm of a liquid of density d is poured into it. The column of liquid in this tube will oscillation with a period T such that

A. $T = 2\pi\sqrt{\frac{MA}{gd}}$

B. $T = 2\pi\sqrt{\frac{M}{2Adg}}$

C. $T = 2\pi\sqrt{\frac{M}{g}}$

D. $T = 2\pi\sqrt{\frac{M}{gdA}}$

Answer: B

Watch Video Solution

101. The displacement of a particle in S.H.M. is given by $x = A\cos(\omega t + \phi)$

At time t=0, x=1 cm, initial velocity $= \pi cm / s$ and angular frequency is π per second. What is the amplitude of SHM ?

A. 2.5 cm

B. 2 cm

C. $\sqrt{2}cm$

D. 1.5 cm

Answer: C

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102. Two particles P and Q start from origin and execute simple harmonic motion along X-axis with same amplitude but with periods $3s$ and $6s$ respectively. The ratio of the velocities of P and Q when they meet is

A. $3:2$

B. $2:3$

C. $1:2$

D. $2:1$

Answer: D

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103. A point mass oscillates along the $x-$ acis according to the law $x = x_0 \cos(\omega t - \pi / 4)$ if the acceleration of the particle is written as, a $= A \cos(\omega + \delta)$, then :

A. $A = x_0, \delta = -\frac{\pi}{4}$

B. $A = x_0 \omega^2, \delta = \frac{\pi}{4}$

C. $A = x_0 \omega^2, \delta = -\frac{\pi}{4}$

D. $A = x_0 \omega^2, \delta = \frac{3\pi}{4}$

Answer: D

Watch Video Solution

104. The displacement of an obuect attached to a spring and executing simple harmonic motion is given by $x = 2 \times 100^{-2} \cos \pi t$ metre. The time at which the maximum speed first occurs is.

A. 0.5 sec

B. 0.25 sec

C. 0.75 sec

D. 0.125 sec

Answer: A

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105. A coin is placed on a horizontal platform which undergoes vertical simple harmonic motion of angular frequency ω. The amplitude of oscillation is gradually increased. The coin will leave contact with the platform for the first time

A. for an amplitude of g^2 / ω^2

B. at the highest position of the platform

C. at the mean position of the platform

D. for an amplitude of g / ω^2

Answer: D

Watch Video Solution

106. A particle executes a linear SHM. In two of its positions the velocities are u and v and the corresponding acceleration are α and β respectively $(0 < \alpha < \beta)$. What is the dis"tan"ce between the positions ?

A. $\dfrac{u^2 + v^2}{\alpha + \beta}$

B. $\dfrac{u^2 - v^2}{\alpha + \beta}$

C. $\dfrac{u^2 + v^2}{\alpha - \beta}$

D. $\dfrac{u^2 - v^2}{\alpha - \beta}$

Answer: B

Watch Video Solution

107. The displacement of a particle in S.H.M. is given by

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

At time t=0, x=1 cm, initial velocity $= \pi cm / s$ and angular frequency is π per second. What is the amplitude of SHM ?

A. 1 cm

B. 2 cm

C. πcm

D. $\sqrt{2} cm$

Answer: D

Watch Video Solution

108. Due to some force F_1 a body oscillates with period $4/5s$ and due to other force F_2 it oscillates with period $3/5s$. If both the forces acts simultaneously in same direction then new period is

A. $\frac{12}{25}s$

B. $\frac{35}{24}s$

C. $\frac{25}{12}s$

D. $\frac{24}{25}s$

Answer: A

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109. A particle moves along the X-axis according to to the law $S = a\sin^2(\omega t - \pi/4)$

The amplitude of the oscillation is

A. $\frac{a}{2}$

B. $\frac{A}{4}$

C. $\frac{A}{5}$

D. A

Answer: A

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110. Two simple harmonic motion are represent by the following equations

$y_1 = 10\sin(3\pi t + \pi/3)$

$y_2 = 5\left(\sin 3\pi t + \sqrt{3}\cos 3\pi t\right)$

Here t is in seconds.

Find out the ratio of their amplitudes.What are the time period of the two motion?

A. $n = \frac{3}{2}$

B. n=1

C. $m = \frac{2}{3}$

D. $m = \frac{1}{2}$

Answer: B

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111. ABCD is a square with side AB = 2. A point P moves such that its distance from A equals its distance from the line BD. The locus of P meets the line AC at T_1 and the line through A parallel to BD at T_2 and T_3. The area of the triangle $T_1T_2T_3$ is :

A. 1

B. 2

C. 3

D. 4

Answer: B

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112. An oscillator consists of a block attached to a spring of spring constant K=300 N/m. At some time t the position (measured from its equilibrium position), velocity and acceleration of the block are $x = 0.1m, v = -15m/s$ and $a = -90m/s^2$. What is the ampliof motion and the mass of the block ?

A. 0.3 m and 0.3 kg

B. 0.4 m and $\frac{1}{4}kg$

C. 0.5 and $\frac{1}{3}kg$

D. $0.5m$ and $\frac{1}{4}kg$

Answer: C

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113. Time period of a particle executing SHM is 8 sec. At $t = 0$ it is at the mean position. The ratio of the distance covered by the particle in the $1st$ second to the $2nd$ second is:

A. $\frac{1}{\sqrt{2}}$

B. $\frac{1}{2}$

C. $\frac{1}{\left(\sqrt{2}-1\right)}$

D. $\frac{\sqrt{2}-1}{3}$

Answer: C

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114. A $0.1kg$ mass is suspended from a wire of negligible mass. The length of the wire is $1m$ and its cross - sectional area is $4.9 \times 10^{-7} m^2$. If the mass is pulled a little in the vertically downward direction and released , it performs SHM with angular frequency $140 rads^{-1}$. If the young's modulus of the material of the wire is $p \times 10^9 Nm^{-2}$, find the value of p.

A. 3

B. 4

C. 5

D. 7

Answer: B

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115. If x, v and a denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period T, then, which of the following does not change with time?

A. $\frac{aT}{x}$

B. $aT + 2pv$

C. $\frac{aT}{v}$

D. $a^2T^2 + 4p^2v^2$

Answer: A

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116. A small marble of mass m oscillates simple harmonically inside a watch glass whose radius of curvature is 2.5m. What is its period of motion. (Take $g = 10m/s^2$)

A. 3 s

B. 3.142 s

C. 3.55 s

D. 3.75 s

Answer: B

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117. A particle is executing a linear SHM. v_1 and v_2 are its velocities at dis"tan"ce x_1 and x_2 from the equilibrium. What is its period of oscillation ?

A. $T = 2\pi\sqrt{\frac{x_2^2 - x_1^2}{v_1^2 - v_2^2}}$

B. $T = 2\pi\sqrt{\frac{v_1^2 - v_2^2}{x_2^2 - x_1^2}}$

C. $T = 2\pi\frac{(v_1 - v_2)}{(x_2 - x_1)}$

D. $T = 2\pi\sqrt{\frac{(x_2 - x_1)^2}{(v_1 - v_2)^2}}$

Answer: A

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118. A particle is executing a linear S.H.M. v_1 and v_2 are as speeds at dis"tan"ces x_1 and x_2 from the equilibrium position. What is its ampiltude of oscillation ?

A. $A = \sqrt{\dfrac{v_1^2 x_2^2 - v_2^2 x_1^2}{v_1^2 - v_2^2}}$

B. $A = \sqrt{\dfrac{v_1^2 - v_2^2}{v_1^2 x_2^2 - v_2^2 x_1^2}}$

C. $A = \dfrac{v_1^2 x_2^2 - v_2^2 x_1^2}{v_1^2 - v_2^2}$

D. $A = \sqrt{\dfrac{v_1^2 x_1^2 - v_2^2 x_2^2}{v_1^2 - v_2^2}}$

Answer: A

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119. A particle executing a linear SHM has velocities of 8 m/s 7 m/s and 4 m/s, respectively at three points at dis"tan"ces of x m, (x+1) m and (x+2)m from the mean position. What is the maximum velocity of the particle ?

A. $\sqrt{50}\frac{m}{s}$

B. $\sqrt{65}\frac{m}{s}$

C. $\sqrt{35}\frac{m}{s}$

D. $\sqrt{20}\frac{m}{s}$

Answer: B

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120. A mass (m) is suspended at the end of a weightless wire of length L, cross-sectional area A and Young's modulus Y. The period of oscillation for the S.H.M. along the vertical direction is

A. $2\pi\sqrt{\frac{YA}{mL}}$

B. $2\pi\sqrt{\frac{mL}{YA}}$

C. $2\pi\sqrt{\frac{mY}{AL}}$

D. $2\pi\sqrt{\frac{AL}{mY}}$

Answer: B

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121. A particle is performing a linear S.H.M about the mean position with the equation of velocity given by $4v^2 - 25 - x^2$. Then the period of motion is

A. 2π

B. π

C. 3π

D. 4π

Answer: D

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122. A block rests on a horizontal table which is executing SHM in the horizontal plane with an amplitude A. What will be the frequency of oscillation, the block will just start to slip? Coefficient of friction $= \mu$.

A. $\frac{1}{2\pi}\sqrt{\frac{\mu g}{A}}$

B. $\frac{1}{4\pi}\sqrt{\frac{\mu g}{A}}$

C. $2\pi\sqrt{\frac{A}{\mu g}}$

D. $4\pi\sqrt{\frac{A}{\mu g}}$

Answer: A

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123. What is the nature of the graph between K.E. and P.E. of a particle performing a finear S.H.M. ?

A. A straight line pas"sin"g through the origin.

B. A straight line parallel to the E_K axis

C. A straight line having intercepts on the E_P and E_K axes

D. A straight line parallel to E_P axis

Answer: C

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124. What is the nature of the graph between the potential energy and total energy of a particle performing a linear S.H.M. ?

A. a "sin"ce curve

B. a "cos"ine curve

C. a circle

D. a straight line

Answer: D

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125. A linear S.H.M is considered as the projection of a U.C.M. on a diameter of the reference circle. The phase angle between the projections of uniform circular motion on two mutually perpendicular diameter is

A. 0

B. π

C. $\frac{3\pi}{4}$

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

Answer: D

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126. The equation of a particle executing a linear S.H.M. is given by $x = 4\cos\omega t + \sin\omega t$. The "tan"gent of its initial phase angle is given by

A. $\tan\alpha = \frac{3}{4}$

B. $\tan\alpha = \frac{4}{3}$

C. $\tan\alpha = 1$

D. $\tan\alpha = \sqrt{3}$

Answer: B

Watch Video Solution

127. A particle performing a linear S.H.M. starts from the positive extremity. Then the epoch of the particle is

A. Zero

B. π radian

C. $\pi / 2$ radian

D. 2π radian

Answer: C

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128. The equation of linear S.H.M. of a particle is given by $x = 0.5\sin\left[4\pi t - \frac{\pi}{3}\right]$, the term $\frac{\pi}{3}$ represents

A. the phase of S.H.M.

B. the initial of S.H.M.

C. angular frequency of S.H.M.

D. period of S.H.M.

Answer: B

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129. Two simple harmonic motions are represented by $y_1 = 10\sin\omega t$ and $y_2 = 15\cos\omega t$. The phase difference between them is

A. Zero

B. $\frac{\pi}{6}$ radian

C. $\frac{\pi}{4}$ radian

D. $\frac{\pi}{2}$ radian

Answer: D

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130. The phase of a linear harmonic oscillator is found to increase by 10π in 10 seconds. The frequency of oscillator is

A. 1 Hz

B. $1/2$ Hz

C. 2 Hz

D. 3π Hz

Answer: B

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131. The equation of a particle executing a S.H.M. is given by $x = 4\sin\omega t + 5\cos\omega t$. The "tan"gent of the initial phase angle is given by

A. $\tan\alpha = \frac{2}{3}$

B. $\tan\alpha = 1$

C. $\tan\alpha = \frac{5}{4}$

D. $\tan\alpha = \frac{4}{5}$

Answer: C

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132. A linear SHM is represented by $x = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$cm.

What is the amplitude of SHM ?

A. 20 cm

B. 50 cm

C. 10 cm

D. $5\sqrt{2}cm$

Answer: C

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133. What is the amplitude of the S.H.M. obtained by combining the motions.

$x_1 = 4\sin\omega t cm, \qquad x_2 = 4\sin\left(\omega t + \frac{\pi}{3}\right)cm$

A. 8 cm

B. $4\sqrt{3}cm$

C. 6 cm

D. $2\sqrt{3}cm$

Answer: B

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134. The periodic times of two particles P and Q executing S.H.M. s are in the ration of 1 : 5. Both start moving from the mean position at the same ins"tan"t. After how many osicllations of P, the two particles will be again in phase at the mean position ?

A. 2

B. 3

C. 4

D. 5

Answer: D

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135. In S.H.M. which one of the following graphs is a straight line ?

A. P.E. against displacement

B. acceleration against timeq

C. total energy against displacement

D. velocity against displacement

Answer: C

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136. The total work done by the restoring force in simple harmonic motion of amplitude A and angular velocity ω in one oscillation is

A. $\frac{1}{2}m\omega^2 A^2$

B. $mA^2\omega^2$

C. Zero

D. $\frac{1}{2}mA\omega$

Answer: C

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137. The displacement of a particle performing a S.H.M. is given by $x = 12\cos(\omega t + \alpha) cm$. If at time t, the displacement of the particle is 6 cm, them the phase of the particle at that instant is

A. $\frac{\pi}{6}$ radian

B. $\frac{\pi}{4}$ radian

C. π radian

D. $\frac{\pi}{3}$ radian

Answer: D

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138. The phase of a particle executing simple harmonic motion is $\frac{\pi}{2}$ when it has

A. Maximum acceleration

B. Maximum energy

C. Minimum displacement

D. Maximum velocity

Answer: A

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139. Two particles A and B execute simple harmonic motions of period T and $5T/4$. They start from mean position. The phase difference between them when the particle A complete an oscillation will be

A. $\frac{\pi}{5}$ rad

B. $\frac{2\pi}{5}$ rad

C. $\frac{\pi}{2}$ rad

D. $\frac{\pi}{3}$ rad

Answer: B

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140. when two displacements represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ are superimposed the motion is

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

Answer: B

Watch Video Solution

141. A particle is exdecuting a linear SHM. What is the nature of the graph between the velocity and displacement of the particle at any ins"tan"t ?

A. a straight line

B. a circle

C. an ellipse

D. a parabola

Answer: C

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142. The S.H.M.s of two particles are given by

$$y_1 = 10\sin\left[2\pi t + \frac{\pi}{6}\right] \text{ and } y_2 = 5\left[\sin 2\pi t + \sqrt{3}\cos 2\pi t\right]$$

The ratio of their amplitudes is

A. $1:2$

B. $1:1$

C. $2:1$

D. $3:1$

Answer: B

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143. Two simple harmonic are represented by the equation $y_1 = 0.1 \sin\left(100\pi + \frac{\pi}{3}\right)$ and $y_2 = 0.1 \cos \pi t$. The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is.

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

B. $-\frac{\pi}{6}$

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

D. $-\frac{\pi}{3}$

Answer: B

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144. What is the minimum phase difference between two S.H.M.s given by

$x_2 = \sin\omega t + \cos\omega t t$ and $x_1 = \frac{1}{2}\sin\omega t + \frac{\sqrt{3}}{2}\cos\omega t$

A. $\frac{\pi}{4}$

B. $\frac{\pi}{12}$

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

D. $-\frac{\pi}{4}$

Answer: B

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145. The displacement of a particle in S.H.M. is given by $x = B\sin(\omega t + \alpha)$. The initial position (at time t=0), of the particle is the initial phase angle if the angular frequency of the particle is $\pi rad/s$?

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

B. $\frac{\pi}{4}$

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

D. $\frac{\pi}{5}$

Answer: B

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146. Two particles execute SHM of same amplitude and frequency on parallel lines. They pass one another when moving in opposite directions each time their displacement is one third their amplitude. What is the phase difference between them?

A. 90°

B. 30°

C. 120°

D. 60°

Answer: C

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147. What is the minimum phase difference between two simple harmonic oscillations given by

$$y_1 = \frac{1}{2}\sin\omega t + \frac{\sqrt{3}}{2}\cos\omega t$$

$y_2 = \sin\omega t + \cos\omega t$?

A. $\frac{\pi}{12}$

B. $\frac{7\pi}{12}$

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

D. $-\frac{\pi}{6}$

Answer: A

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148. The force constant of a linear harmonic oscillator is 10 N/m. If is P.E. at a point in its path is 0.05J, its corresponding displacement is

A. 1 metre

B. 0.5 m

C. 0.25 m

D. 0.1 m

Answer: D

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149. A body executes SHM with an amplitude a. At what displacement from the mean positions, the potentail energy of the body is one-fourth of its total energy?

A. $\frac{A}{4}$

B. $\frac{A}{2}$

C. $\frac{A}{3}$

D. $\frac{3A}{4}$

Answer: B

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150. For a particle performing a S.H.M. the potential and kinetic energies will be equal when the displacement of the particle is

A. A

B. $\frac{A}{2}$

C. $A\sqrt{2}$

D. $\frac{A}{\sqrt{2}}$

Answer: D

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151. When the displacment in S.H.M. is half the amplitude, the ratio of potential energy to the total energy is

A. $\frac{1}{2}$

B. $\frac{1}{8}$

C. 1

D. $\frac{1}{4}$

Answer: D

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152. A particle executes a linear S.H.M. of amplitude A. At what dis"tan"ce from the mean position is its K.E. equal to its P.E. ?

A. 0.51 A

B. 0.61 A

C. 0.81 A

D. 0.71 A

Answer: D

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153. When a long spring is stretched by 1 cm, the potential energy stored in the spring is U. What will be the potential energy stored in it if it is stretched by 4 cm ?

A. 4 U

B. 9 U

C. 16 U

D. 25 U

Answer: C

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154. For a particle executing $S.H.M.$, the kinetic energy K is given $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is:

A. $\frac{K_0}{2}$

B. K_0

C. $2K_0$

D. data not sufficient to obtain max P.E.

Answer: B

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155. When the displacement of a linear harmonic oscillator is $1/3$ of its amplitude, the ratio of its total energy to its potential energy is

A. 3

B. 4

C. 9

D. $\frac{1}{9}$

Answer: C

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156. The potential energies of a linear harmonic oscillator at the mean position, extreme positions and an intermediate position are 0, 0.5J and 0.3 J respectively. Its total energy is given by

A. 0.7 J

B. 0.5 J

C. 0.8 J

D. 0.25 J

Answer: B

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157. A spring of spring constant $5 \times 10^3 N/m$ is stretched by 4 cm from its unstreched of position. Then the work required to stretch it further by 4 cm is

A. 6 N

B. 12 N

C. 18 N

D. 3 N

Answer: B

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158. The maximum potential energy of a simple harmonic oscilator is $U_{\max}$. The the P.E. of the oscillator when it is half way to its end point is

A. $\frac{U_{\max}}{2}$

B. $\frac{U_{\max}}{3}$

C. $\frac{U_{\max}}{4}$

D. $2U_{\max}$

Answer: C

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159. When the displacement of a particle in S.H.M. is 0.2m, its Potential energy is equal to 2 J. The force constant of the S.H.M. is

A. $100N/m$

B. $50N/m$

C. $200N/m$

D. $25N/m$

Answer: A

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160. The total energy of a particle in linear S.H.M. is 20 J. What is its kinetic energy when its displacment is half of the amplitude ?

A. 10 J

B. 5 J

C. 15 J

D. 25 J

Answer: C

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161. The P.E. of a linear harmonic oscillator is 4J, when its displacment is equal to half its amplitude. The total energy of the particle is

A. 8 J

B. 32 J

C. 16 J

D. 24 J

Answer: C

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162. For a particle performing a linear SHM the ratio of the frequency of oscillation and the frequency of kinetic energy is

A. $1:1$

B. $2:1$

C. $1:2$

D. $1:4$

Answer: C

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163. A linear harmonic oscillator of force constant $10^6 N/m$ and amplitude 2 cm has

A. a maximum P.E. of 100 Joule

B. a maximum K.E. of 150 Jule

C. a total energy of 200 J

D. a total energy of 300 J

Answer: C

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164. The equation of a body of mass m and performing a linear S.H.M is given by $x = a\sin\omega t + b\sin\left(\omega t + \frac{\pi}{2}\right)$. The total energy of the particle at any ins"tan"t is

A. $\frac{1}{2}m\omega^2 ab$

B. $\frac{\frac{1}{2}m\omega^2}{\sqrt{a^2+b^2}}$

C. $\frac{1}{2}m\omega^2\left(a^2+b^2\right)$

D. $\frac{1}{2}m\omega^2\sqrt{a^2+b^2}$

Answer: C

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165. The potential energy of a particle, executing a simple harmonic motion, at a dis"tan"ce x from the equilibrium position is proportional to

A. $\sqrt{x}$

B. x

C. x^2

D. x^3

Answer: C

Watch Video Solution

166. If the KE of a particle performing a SHM of amplitude A is $\frac{3}{4}$ of its total energy, then the value of its displacement is

A. $x = \pm \frac{A}{2}$

B. $x = \pm \frac{A}{4}$

C. $x = \pm \frac{\sqrt{3}A}{2}$

D. $x = \pm \frac{A}{\sqrt{2}}$

Answer: A

Watch Video Solution

167. When a particle executing a linear S.H.M. moves from its extreme position to the mean position, its

A. K.E. decreases and potential energy increases

B. K.E. increases and potential energy decreases

C. potential energy becomes zero but kinetic energy remains constant

D. P.E. increases but the K.E. becomes zero

Answer: B

Watch Video Solution

168. When the displacement of a particle executing SHM is one-fourth of its amplitude, what fraction of the total energy is the kinetic energy?

A. $\frac{3}{4}$

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

C. $\frac{1}{2}$

D. $\frac{2}{5}$

Answer: A

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169. The kinetic energy of a particle executing SHM is 16J. When it is in its mean position. If the amplitude of oscillation is 25cm and the mass of the particle is 5.12 kg, the time period of its oscillation in second is

A. $\frac{\pi}{3}$ sec

B. $\frac{\pi}{5}$ sec

C. $\frac{\pi}{2}$ sec

D. $\frac{\pi}{10}$ sec

Answer: B

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170. The total energy of a body executing a linear S.H.M. is 20 J. What is the maximum velocity of the body, if the mass of the body is 0.4 kg ?

A. 5 m/s

B. 10 m/s

C. 15 m/s

D. 20 m/s

Answer: B

Watch Video Solution

171. A simple harmonic oscillator has a period T and energy E. the amplitude of the oscillator is doubled. Choose the correct answer.

A. the period gets houbled while energy remains the same

B. the period remains the same and energy becomes for times

C. both the period and the energy get doubled

D. energy gets doubled while the period remains the same

Answer: B

Watch Video Solution

172. A spring, which is initially in its unstretched condition, is first stretched by a length x and then again by a further length x. The work done in the first case is W_1 and in the second case is W_2.

A. $W_2 = 4W_1$

B. $W_2 = W_1$

C. $W_2 = 2W_1$

D. $W_2 = 3W_1$

Answer: D

Watch Video Solution

173. When a particle performs a linear S.H.M. the ratio of its K.E. at the mean position to its P.E. at a point midway between the mean and extreme position is

A. $4:1$

B. $1:4$

C. $3:2$

D. $2:3$

Answer: A

Watch Video Solution

174. The maximum velocity of a particle performing a S.H.M is v. If the periodic time is made $1/3$rd and the amplitude is doubled, then the new maximum velocity of the particle will be

A. 3 v

B. 6 v

C. $v/6$

D. $3v/2$

Answer: B

Watch Video Solution

175. A point particle of mass $0.1kg$ is executing SHM of amplitude $0.1m$. When the particle passes through the mean position, its kinetic energy is $8 \times 10^{-3} J$. Obtain the equation of motion of this particle if the initial phase of oscillation is 45°.

A. $y = 0.4\sin(6t + \pi/4)$

B. $y = 0.1\sin(4t + \pi / 4)$

C. $y = 0.1\sin(2t + \pi / 4)$

D. $y = 0.4\sin(3t + \pi / 4)$

Answer: B

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176. In a simple harmonic oscillator, at the mean position

A. kinetic energy is maximum, potential energy is minimum

B. both kinetic and potential energies are minimum

C. both kinetic and potential energies are maximum

D. kinetic energy is minimum, potential energy is maximum

Answer: A

Watch Video Solution

177. A child is swinging a swing. Minimum and maximum heights fo swing from the earth's surface are 0.75 m and 2 m respectively. The maximum velocity of this swing is

A. 8 m/s

B. 10 m/s

C. 15 m/s

D. 5 m/s

Answer: D

Watch Video Solution

178. The total energy of a particle executing SHM is directly proportional to the square of the following quantity.

A. its velocity in equilibrium position

B. its displacement from equilibrium position

C. the square of the amplitude of its motion

D. frequency of oscillation

Answer: C

Watch Video Solution

179. A particle executes simple harmonic motion with a frequency. (f). The frequency with which its kinetic energy oscillates is.

A. f

B. 2f

C. f2

D. 4 f

Answer: B

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

where x is the displacement from the mean position, hence total energy is independent of x.

A. proportional to x^2

B. proportional to x

C. independen of x

D. proportional to $\sqrt{3}$

Answer: C

Watch Video Solution

181. A particle executes a S.H.M. Its P.E., K.E. and total energy are measured as function of displacement of x. Then its

A. K.E. is maximum, when x is maximum

B. Total energy is maximum, when x=0

C. P.E. is maximum, when x=0

D. K.E. is maximum, when x =0

Answer: D

Watch Video Solution

182. A particle is vibrating in a simple harmonic motion with an amplitude of 4 cm . At what displacement from the equilibrium position, is its energy half potential and half kinetic

A. 1 cm

B. 2 cm

C. $\sqrt{2}cm$

D. $2\sqrt{2}cm$

Answer: D

Watch Video Solution

183. A linear harmonic osciallator executes a SHM of period 4s. Which of the following quantities assoiated with the oscillator will exhibit a simple harmonic motion of period 2 second ?

A. velocity

B. phase difference between acceleration and displacemnet

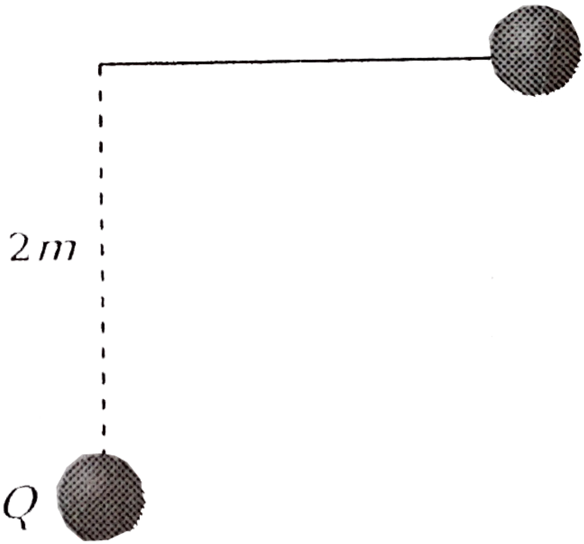
C. kinetic and potential energies

D. total energy

Answer: C

Watch Video Solution

184. A pendulum of length 2 m lift at P . When it reaches Q , it losses 10% of its total energy due to air resistance. The velocity at Q is



A. 2 m/sec

B. 8 m/sec

C. 6 m/sec

D. 1 m/sec

Answer: C

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185. Two springs of force constants $K_1 = K_2$ are stretched by the same force. It W_1 and W_2 are the energies stored its them respectively, then

A. $W_1 < W_2$

B. $W_1 > W_2$

C. $W_1 = W_2 / 2$

D. $W_1 = W_2$

Answer: A

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186. Starting from the origin a body oscillates simple harmonically with a period of 2s . After time $\frac{1}{x}$ second willthe kinetic energy be $75\,\%$ of its total energy , then value of x is

A. $\frac{1}{4}s$

B. $\frac{1}{2}s$

C. $\frac{1}{3}s$

D. $\frac{1}{6}s$

Answer: C

Watch Video Solution

187. A particle starts oscillating simple harmonically from its equilibrium position then, the ratio of kinetic energy and potential energy of the particle at the time $T/12$ is: $(T = \text{time period})$

A. $1:2$

B. $2:1$

C. $1:3$

D. $3:1$

Answer: D

Watch Video Solution

188. A simple pendulum of length l has a maximum angular displacement θ. The maximum kinetic energy of the bob of mass m will be

A. $\frac{1}{2}\frac{ML}{g}$

B. $\frac{Mg}{2L}$

C. $MgL(1-\cos\alpha)$

D. $\frac{MgL\sin\alpha}{2}$

Answer: C

Watch Video Solution

189. A particle of mass m executes simple harmonic motion with amplitude a and frequency v. The average kinetic energy during its motion from the position of equilibrium to the ends is

A. $2\pi^2 ma^2v^2$

B. $\pi^2 ma^2v^2$

C. $\frac{1}{4}\pi^2 ma^2v^2$

D. $4\pi^2, a^2v^2$

Answer: B

Watch Video Solution

190. 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. $\sqrt{E}=\sqrt{E_1}+\sqrt{E_2}$

B. $E=E_1+E_2$

C. $E=E_1-E_2$

D. $\sqrt{E}=\sqrt{E_1}-\sqrt{E_2}$

Answer: A

Watch Video Solution

191. A particle of mass m is executing oscillation about the origin on X- axis Its potential energy is V(x)=kIxI Where K is a positive constant If the amplitude oscillation is a, then its time period T is proportional

A. Proportinal to $a^{3/2}$

B. Independent of a

C. Proportional to $\frac{1}{\sqrt{a}}$

D. Proportional to $\sqrt{a}$

Answer: C

Watch Video Solution

192. The restoring force and P.E. of a particle executing a S.H.M. are F and U respectively when its displacement is x. The relation between F, U ad x is

A. $\frac{F}{U} + x = 0$

B. $\frac{2U}{F} + x = 0$

C. $\frac{F}{2U} + x = 0$

D. $\frac{U}{F} + x = 0$

Answer: B

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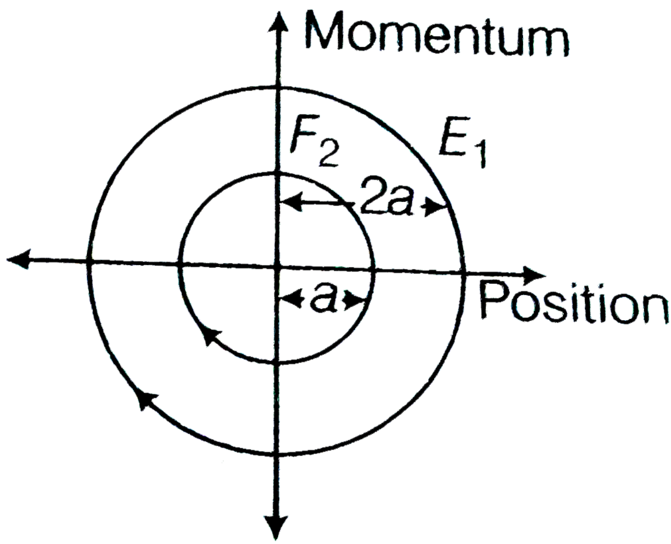
193. The phase space diagram for harmonic motion is a circle centered at the origin as shown in figure. The to circles represent the same oscillator but for different initial conditions and E_1 and E_2 are the total mechanical energy, respectively . Then



A. $E_1 = \sqrt{2}E_2$

B. $E_1 = 2E_2$

C. $E_1 = 4E_2$

D. $E_1 = 16E_2$

Answer: C

Watch Video Solution

194. A linear harmonic oscillator of force constant $2 \times 10^6 N/m$ and amplitude (0.01 m) has a total mechanical energy of (160 J). Its.

A. maximum potential energy is 100 J

B. maximum kinetic energy is 160 J

C. maximum potential energy is 160 J

D. maximum potential energy is zero

Answer: C

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195. A body of mass 0.2 kg executes a linear SHM along the X-axis. When it is at position x=0.04 m, its P.E. =0.4 J and K.E. -0.5 J. What is the amplitude of oscillation ?

A. 0.03 m

B. 0.05 m

C. 0.06 m

D. 0.08 m

Answer: C

Watch Video Solution

196. A pendulum clock keeps correct tiime at 30° latitude.

If a is taken to poles, then

A. it keeps correct time

B. it gains time

C. it loses time

D. its period increases

Answer: B

Watch Video Solution

197. The tension in the string of a simple pendulum is maximum, when the bob of the pendulum

A. is at the extreme position

B. midway between the mean position and extreme position

C. is at the mean position

D. starts oscillating with very large amplitudes

Answer: C

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198. For small amplitudes, the force constant of a simple pendulum is

A. directly proportional to the acceleration due to gravity

B. inversely proportional to the acceleration due to gravity

C. independent of the mass of the bob and the length of the pendulum

D. directly proportional to the mass of the bob

Answer: D

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199. A simple pendulum is attached to the roof of a lift. When the lift is at rest, the frequency of oscillation of the simple pendulum is 1 Hz. What will be its frequecy of oscillation, if the cable wires controlling the vertical motion of the lift ar broken ?

A. 2 Hz

B. zero

C. infinity

D. 1 Hz

Answer: B

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200. A simple pendulum completes 10 oscillation in 30 second. Another simple pendulum takes 40 seconds to complete 10 oscillations at the same place. The ratio of the lengths of the simple pendulums is

A. $\frac{5}{16}$

B. $\frac{9}{16}$

C. $\frac{3}{16}$

D. $\frac{13}{16}$

Answer: B

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201. What is the maximum velocity of the bob of a second's pendulum, if the amplitude of oscillation of the pendulum is 0.1 m ?

A. 0.2 m/s

B. 0.5 m/s

C. 0.3142 m/s

D. 0.6284 m/s

Answer: C

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202. If the KE of a particle performing a SHM of amplitude A is $\frac{3}{4}$ of its total energy, then the value of its displacement is

A. x= A

B. x=2A

C. $x = \frac{\sqrt{3}}{2}A$

D. $x = \frac{\sqrt{3}}{4}A$

Answer: C

Watch Video Solution

203. A simple pendulum, suspended from the coiling of a lift, has a period of oscillation T, when the lift is at rest. If the lift starts moving upwards with an acceleration a =3g, then the new period will be

A. 2T

B. 4T

C. $\frac{T}{3}$

D. $\frac{T}{2}$

Answer: D

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204. The acceleration due to gravity on the moon is $\frac{1}{6}$th the acceleration due to gravity on the surface of the earth. If the length of a second's pendulum is 1 m on the surface of the earth, then its length on the surface of the moon will be

A. $\frac{1}{2}m$

B. 6 m

C. $\frac{1}{6}m$

D. $\frac{1}{4}m$

Answer: C

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205. The bob of a simple pendulum performs a S.H.M. of amplitude 2 cm. If the mass of the bob is 100 gram and its total energy is 32×10^{-5} J. The periodic time of S.H.M. is

A. 1.2 sec

B. 2 sec

C. 2.5 sec

D. 1.571 sec

Answer: D

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206. The period of a simple pendulum is double, when its length is increased by 1.2 m. The original length of the simple pendulum is

A. 0.2 m

B. 0.3 m

C. 0.4 m

D. 0.5 m

Answer: C

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207. When the length of simple pendulum is increased by 22 cm, the period increases by 20 %. The original length of the simple pendulum is

A. 30 cm

B. 50 cm

C. 75 cm

D. 90 cm

Answer: B

Watch Video Solution

208. The periodic time of a second's pendulum as seen by an astronaut in a spaceship is

A. zero

B. infinity

C. 2 sec

D. 20 sec

Answer: B

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209. If a simple pendulum oscillates with an amplitude of 50 mm and time period of 2 sec, then its maximum velocity is

A. 0.10 m/s

B. 0.2 m/s

C. 0.157 m/s

D. 0.4 m/s

Answer: C

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210. What is the percentage change in the periodic time of a simple pendulum, if its amplitude is increased by 2 % ?

A. 0.02

B. 0.04

C. zero percent

D. 0.1

Answer: C

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211. 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. $\sqrt{2gl}$

B. $\sqrt{2gl(1+\cos\theta)}$

C. $\sqrt{2gl(1-\cos\theta)}$

D. $\sqrt{2gl(1+\sin\theta)}$

Answer: C

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212. The periodic time of a simple pendulum is 3 sec. The mass of its hollow spherical bob is 100 gram. The bob is then filled with sand, so that the mass of the bob becomes 200 gram. Then the new period of oscillation of the simple pendulum wil be

A. 6 sec

B. 12 sec

C. 3 sec

D. 9 sec

Answer: C

Watch Video Solution

213. the period of a simple pendulum in a stationary lift is 3 sec. If the lift accelerates downwards with an acceleration $\frac{g}{4}$, its period of oscillation will be

A. $\sqrt{3}s$

B. $\frac{1}{2\sqrt{3}}s$

C. $2\sqrt{3}s$

D. 6s

Answer: C

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214. A wall clock regulated by a seconds pendulum goes slow by 20 second per day. How many oscillation are performed by the faulty pendulum per day ?

A. 43000

B. 43100

C. 43200

D. 43190

Answer: D

Watch Video Solution

215. A simple pendulum of length L is suspended from the roof of a train. If the train moves in a horizontal direction with an acceleration 'a' then the period of the simple pendulum is given by

A. $T = 2\pi\sqrt{\frac{l}{g}}$

B. $T = 2\pi\sqrt{\frac{l}{g+a}}$

C. $T = 2\pi\sqrt{\frac{l}{(g^2+a^2)}}$

D. $T = 2\pi\sqrt{\frac{l}{g-a}}$

Answer: C

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216. The period of a simple pendulum suspended from the ceiling of a car is T when the car is at rest. If the car moves with a constant acceleration the period of the pendulum

A. T is reduced, T is incrased

B. T is reduced, T remains constant

C. T is increased, T remains constant

D. T remains constant, T is decreased

Answer: B

Watch Video Solution

217. The bob of a simple pendulum goes from one extremity to another extremity in 2 s and covers a dis"tan"ce of 8 cm. If its motion is assumed to be simple harmonic, then the maximum velocity of the bob is

A. 4 cm/s

B. 6.28 cm/s

C. 15.7 cm/s

D. 12.56 cm/s

Answer: B

Watch Video Solution

218. The acceleration due to gravity at a place changes from $9.8 m / s^2$ to $9.5 m / s^2$. Then the length of the second's pendulum changes by

A. 0.3 m

B. 3 cm

C. 0.3 cm

D. 6 cm

Answer: B

Watch Video Solution

219. If a simple pendulum oscillates with an amplitude of 50 mm and time period of 2 sec, then its maximum velocity is

A. 0.04 m/s

B. 0.08 m/s

C. 0.12 m/s

D. 0.16 m/s

Answer: D

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220. A second's pendulum is mounted in a rocket. Its period of oscillation decreases when the rocket

A. moves around the earth in a geostationary orbit

B. moves down with uniform acceleration

C. moves up with uniform velocity

D. moves up with uniform acceleration

Answer: D

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221. As pendulum clock gives correct time at the equator, Will it gain time or loose time as it is taken to the poles?

A. It will lose time

B. It will gain time

C. There will be no change

D. It will gain time on the north pole and lose time on the south pole

Answer: B

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222. A simple pendulum executing S.H.M. is falling freely along with the support. Then

A. its periodic time increases

B. its periodic time decreases

C. its periodic time does not change

D. it des not oscillate at all

Answer: D

Watch Video Solution

223. The length of a simple pendulum is increased by 1%. Its time period will

A. increase by 2%

B. decrease by 2 %

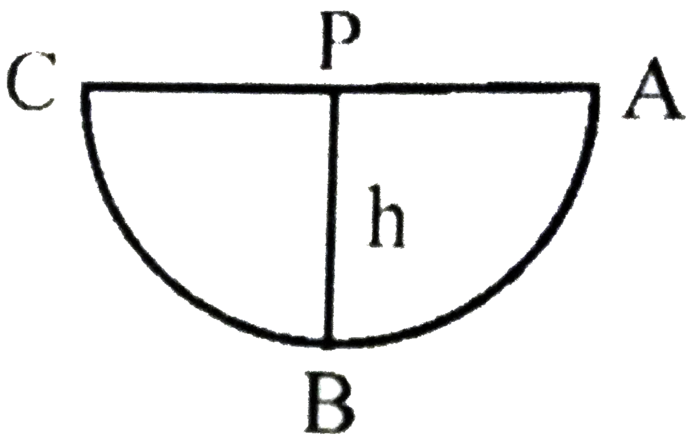
C. increase by 0.5 %

D. decrease by 0.5 %

Answer: C

Watch Video Solution

224. A simple pendulum with a bob of mass m oscillates from A to C and back to A, such that PB=h,



If the acceleration due to gravity is 'g', then the velocity of the bob as it passes through B is

A. zero

B. 2gh

C. $\sqrt{2gh}$

D. mgh

Answer: C

Watch Video Solution

225. The periodic time of a simple pendulum is 6.28 sec and the amplitude of oscillation is 3 cm. The maximum acceleration of the pendulum is

A. $5cm / s^2$

B. $4cm / s^2$

C. $3cm / s^2$

D. $2cm / s^2$

Answer: C

Watch Video Solution

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

A. $\frac{T}{3}$

B. $\frac{\sqrt{3}}{2}(T)$

C. 3 T

D. $\sqrt{\frac{3}{2}T}$

Answer: B

Watch Video Solution

227. The time period of a simple pendulum inside a stationary lift is $\sqrt{5}$ s. What will be the time period when the lift moves upward with an acceleration $\frac{g}{4}$?

A. $2\sqrt{5}\,\text{sec}$

B. $(2+\sqrt{5})\,\text{sec}$

C. 2 sec

D. $\frac{2}{\sqrt{5}}$sec

Answer: C

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228. A body falling freely on a planet covers 18 m in 3 s. What is the time period of a simple pendulum of length 1 m on the planet ?

A. 1.57 s

B. 3.14 s

C. 6.28 s

D. 4.5 s

Answer: B

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229. What effect occurs on the frequency of a pendulum if it is taken from the earth surface to deep into a mine

A. First increases and then decreases

B. Increases

C. Decreases

D. First decreases and then increases

Answer: C

Watch Video Solution

230. A simple pendulum suspended from the ceiling of a trans has a time period T when the train is at rest. If the train is accelerating uniformly at a then its time period

A. Decrease

B. Remain unaffected

C. Become infinite

D. Increase

Answer: A

Watch Video Solution

231. A second's pendulum is placed in a space laboratory orbiting around the earth at a height $3R$, where R is the radius of the earth. The time period of the pendulum is

A. $2\sqrt{3}\,\text{sec}$

B. 4 sec

C. Infinite

D. zero

Answer: C

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232. A particle executes a linear S.H.M. of amplitude A and period T. It starts from the mean position. The time required to cover a dis"tan"ce A/2 is

A. $\frac{T}{6}$

B. $\frac{T}{12}$

C. $\frac{T}{3}$

D. $\frac{T}{4}$

Answer: A

Watch Video Solution

233. If l_1 and l_2 are the lengths of a seconds pendulum at the poles and the equator of the earth, then

A. $l_1 > l_2$

B. $l_1 < l_2$

C. $l_1 = l_2$

D. $l_1 = 0.9 l_2$

Answer: A

Watch Video Solution

234. The velocity of the bob of a simple pendulum in the mean position is v. If its amplitude is doubled, by keeping the same length, then its velocity in the mean position will be

A. 2v

B. v

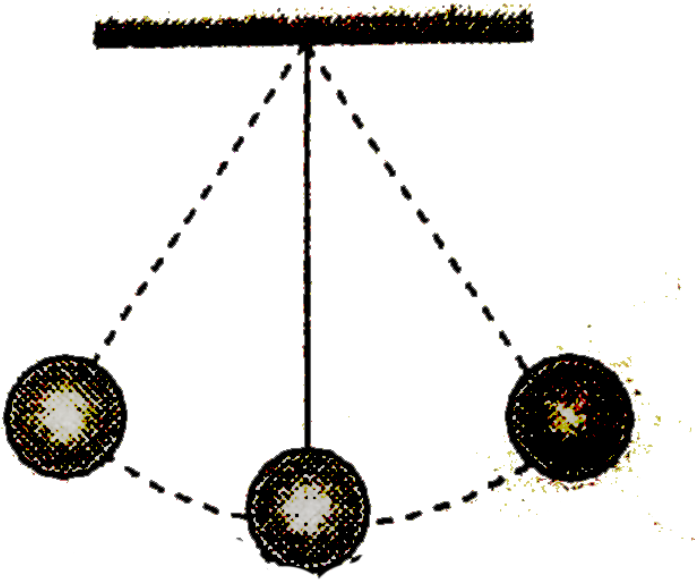
C. $\frac{v}{2}$

D. 4v

Answer: A

Watch Video Solution

235. What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to vertical height of 10 cm (take $g = 9.8 m/s^2$)



A. 0.6 m/s

B. 1.4 m/s

C. 2.2 m/s

D. 1.8 m/s

Answer: B

Watch Video Solution

236. A child swinging on a swing in sitting position, stands up, then the time period of the swing will.

A. will increase

B. will decrease

C. will not be affected

D. will be doubled

Answer: B

Watch Video Solution

237. Simple pendulum is executing simple harmonic motion with time period T. If the length of the pendulum is increased by 21%, then the increase in the time period of the pendulum of the increased length is:

A. 0.5

B. 0.4

C. 0.2

D. 0.1

Answer: D

Watch Video Solution

238. The bob of a simple pendulum of length L, is displaced through 90°, from its mean position and then released. What will be the tension in the string when the bob of mass m will be its lowest position ?

A. mg

B. 2 mg

C. 3 mg

D. 6 mg

Answer: C

Watch Video Solution

239. The bob of a simple pendulum is a hollow cylinder, with a small hole in the bottom. It is filled with sand and set into oscillation. Its periodic time (T) is measured at regular intervals. As the sand starts coming out we find that

A. T increases with time

B. T does not change with time

C. T first decrases and then increases

D. T first increases and then decreases

Answer: D

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240. Two pendulums X and Y of time periods $4s$ and $4.2s$ are made to vibrate simultaneously. They are initially in same phase. After how many vibration of X, they will be in the same phase again ?

A. 7

B. 14

C. 21

D. 28

Answer: C

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241. A particle is performing a linear simpfe harmonic motion of amplitude 'A'. When it is midway between its mean and extreme position, the magnitudes of its velcoity and acceleration are equal. What is the periodic time of the motion ?

A. $\frac{\sqrt{3}}{2\pi}\sec$

B. $\frac{1}{2\pi\sqrt{3}}\sec$

C. $2\pi\sqrt{3}\sec$

D. $\frac{2\pi}{\sqrt{3}}\sec$

Answer: D

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242. Two simple pendulums have time periods T and $\frac{5T}{4}$. They start vibrating at the same instant from the mean position in the same phase. The phase difference between them when the bigger pendulum completes one oscillation will be

A. 90°

B. 60°

C. 45°

D. 30°

Answer: A

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243. A simple pendulum has time period T The bob is given negative charge and surface below it is given positive change new time period will be

A. Infinite

B. Equal to T

C. Greater than T

D. Less than T

Answer: D

Watch Video Solution

244. A simple pendulum of length l has a brass bob attached at its lower end. Its period is T . If a steel bob of same size, having density x times that of brass, replaces the brass bob and its length is changed so that period becomes 2 T, then new length is

A. $4/x$

B. $\frac{4l}{x}$

C. 4l

D. 2l

Answer: C

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245. If the length of a simple pendulum is halved, then its energy becomes

A. double

B. half

C. 4 times of the initial

D. 3 times of the initial

Answer: A

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246. Two simple pendulums of length 0.4 m and 1.6 m respectively are given small linear displacements in one direction at the same ins"tan"t. After how many complete oscillations of the pendulum of the shorter length, they will again be in phase ?

A. 1

B. 2

C. 4

D. 6

Answer: B

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247. The periodic time of a simple pendulum, oscillating in air is T. But if the bob of the simple pendulum is completely immersed in a nonviscous liquid, whose density is $\frac{1}{20}$ th of the material of the bob, then its new period will be

A. T

B. $\frac{19}{20}T$

C. $\frac{20}{19}T$

D. $\sqrt{\frac{20}{19}}T$

Answer: D

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248. The bob of a simple pendulum of length L is released at time t = 0 from a position of small angular displacement θ_0 . Its linear displacement at time t is given by :

A. $x = A\sin 2\pi\sqrt{l/g} \times t$

B. $x = A\cos 2\pi\sqrt{l/g} \times t$

C. $x = A\cos\sqrt{g/l} \times t$

D. $x = A\sin\sqrt{g/l} \times t$

Answer: C

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249. A pendulum clock is running fast. In order to correct it we should

A. reduce the amplitude of oscillation

B. reduce the mass of the bob

C. reduce the length of pendulum

D. increase the length of the pendulum

Answer: D

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250. A simple pendulum oscillates with an anglular amplitude of θ. If the maximum tension in the string is 3 times the minimum tension, then the value of $\cos\theta$ is

A. $\frac{1}{2}$

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

C. $\frac{3}{4}$

D. $\frac{3}{5}$

Answer: D

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251. A simple pendulum has time period T_1/ The point of suspension is now moved upward according to the realtion $y = kt^2 (k = 1m / s^2)$ where y is vertical displacement, the time period now becomes T_2. The ratio of $\left(\frac{T_1}{T_2}\right)^2$ is : $(g = 10m / s^2)$

A. $\frac{5}{6}$

B. $\frac{6}{3}$

C. $\frac{4}{5}$

D. $\frac{5}{4}$

Answer: B

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252. At a particular place, a simple pendulum of length 1m, makes 400 oscillations in 13 minute. What is the length of a second's pendulum at this place ?

A. 98 cm

B. 100 cm

C. 102 cm

D. 105 cm

Answer: D

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253. The angular velocity and amplitude of simple pendulum are ω and r respectively. At a displacement x from the mean position, if its kinetic energy is T and potential energy is U, find the ration of T to U.

A. $\left(\frac{a^2 - x^2\omega^2}{x^2\omega^2}\right)$

B. $\frac{x^2\omega^2}{(a^2 - x^2\omega^2)}$

C. $\frac{(a^2 - x^2)}{x^2}$

D. $\frac{x^2}{(a^2 - x^2)}$

Answer: C

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254. 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. $\tan^{-1}\frac{g}{a}$ in the forward direction

B. $\tan^{-1}\frac{g}{a}$ in the backward direction

C. $\tan^{-1}\frac{a}{g}$ in the backward direction

D. $\tan^{-1}\frac{a}{g}$ in the forward direction

Answer: C

255. A pendulum bob has a speed of $3ms^{-1}$ at its lowest position. The pendulum is 0.5 m long. The speed of the bob, when string makes an angle of 60° to the vertical is $(\text{take, g} = 10ms^{-1})$

A. $\frac{1}{2}m/s$

B. $2m/s$

C. $\frac{1}{3}m/s$

D. $3m/s$

Answer: B

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256. A simple pendulum has a time period of 3 s. If the point of suspension of the pendulum starts moving vertically upwards with a velocity =v=kt where $k = 4.4m/s^2$, the new time period will be (Take $g = 10m/s^2$)

A. $\frac{5}{3}s$

B. 2.5 s

C. 4.4 s

D. $\frac{9}{4}s$

Answer: B

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257. A simple pendulum is constructed by attaching a bob of mas m to a string of length L fixed at its upper end. The bob oscillates in a vertical circle. It is found that the speed of the bob is v when the string makes an angle θ with the vertical. Find the tension in the string at this instant.

A. $T = m\left(\frac{v^2}{L} + g\cos\alpha\right),$

$F = m\sqrt{g^2\sin^2\alpha + \frac{v^4}{L^2}}$

B. $T = m\left(\frac{v^2}{L} + g\cos\alpha\right),$

$F = m\sqrt{g^2\cos^2\alpha + \frac{v^4}{L^2}}$

C. $T = m\left(\frac{v^2}{L} + g\cos\alpha\right),$

$F = m\sqrt{g^2\sin^2\alpha - \frac{v^4}{L^2}}$

D. $T = m\left(\frac{v^2}{L} + g\cos\alpha\right)$,

$F = m\sqrt{g^2\cos^2\alpha - \frac{v^4}{L^2}}$

Answer: A

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258. The length of a second's pendulum on the surface of earth is 1 m. What will be the length of a second's pendulum on the moon?

A. $\frac{1}{3}m$

B. 6 m

C. $\frac{1}{6}m$

D. 3 m

Answer: C

Watch Video Solution

259. A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface, where R is the radius of the earth. The value of $\frac{T_2}{T_1}$ is

A. 0.5

B. 2

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

Answer: A

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260. A simple pendulm has a length L and a bob of mass M. The bob is vibrating with amplitude a .What is the maximum tension in the string?

A. $T_{\max} = mg\left[1 + \left(\frac{A}{l}\right)^2\right]$

B. $T_{\max} = mg\left[1 - \left(\frac{A}{l}\right)^2\right]$

C. $T_{\max} = mg\left[1 - \left(\frac{l}{A}\right)^2\right]$

D. $T_{\max} = mg\left[1 + \left(\frac{l}{A}\right)^2\right]$

Answer: A

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261. The equation

$$\frac{d^2y}{dt^2} + b\frac{dy}{dt} + \omega^2 y = 0$$

represents the equation of motion for a

A. Free vibrator

B. Damped harmonic oscillator

C. Forced oscillator

D. Resonant oscillator

Answer: B

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262. The amplitude of a vibrating body situated in a resisting medium

A. remains constant with time

B. increases with time

C. decreases exponentially with time

D. decreases linearly with time

Answer: C

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263. In case of a forced vibration, the resonance wave becomes very sharp when the

A. quality factor is small

B. damping force is small

C. restoring force is small

D. applied periodic force is small

Answer: B

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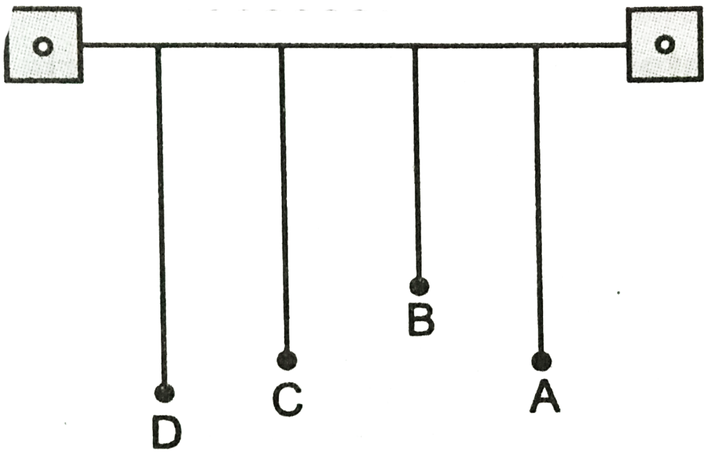
264. Four pendulums A,B,C and D are suspended from the same elastic support as shown in figure. A and C are of the same length , while B is smaller thatn A and D is larger than A. If A is given a transverse displacement,



A. All the four pendulums will oscillate with equal amplitudes

B. B will oscillate with maximum amplitude

C. C will oscillate with maximum amplitude

D. D will oscillate with maximum amplitude

Answer: C

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265. When a dampled harmonic oscillator completes 100 oscillations, its amplitude is reduced to $\frac{1}{3}$ of its initial value. When will be its amplitude when it completes 200 oscillations?

A. $\frac{1}{5}$

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

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

D. $\frac{1}{9}$

Answer: D

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266. A body of mass 0.25 kg is attached to a vertical spring. The spring is executing damped simple harmonic spring will drop to half its initial value ? [The damping constant b = 0.05 kg/s]

A. $4\log_{10^2}$

B. $4\log_{e^2}$

C. $5\log_{e^2}$

D. $5\log_{10^2}$

Answer: C

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267. Amplitude of a wave is represented by $A\frac{c}{a+b+c}$

Then resonance will occur when

A. $b = -\frac{a}{2}$

B. b =0 and a =- c

C. $b = -\frac{c}{2}$

D. None of these

Answer: B

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268. The amplitude of damped oscillator becomes half in one minute. The amplitude after 3 minutes will be $1/x$ times the original, where x is

A. 3^2

B. 2×3

C. 3×2^2

D. 2^3

Answer: D

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269. When a tuning fork of frequency 262 Hz is struck, it loses half of its energy after 4s. What is the decay time t ?

A. 3 s

B. 4.5 s

C. 5.77 s

D. 6.28 s

Answer: C

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270. A block off mass 200 g executing SHM under the unfluence of a spring of spring constant $k = 90Nm^{-1}$ and a damping constant $gb = 40gs^{-1}$. The time elaspsed for its amplitude to drop to halff of its initial value is (Given, ln $(1/2) = -0.693$)

A. 7s

B. 9s

C. 4s

D. 11s

Answer: A

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271. A block of mass one kg is fastened to a spring with a spring constant $50Nm^{-1}$. The block is pulled to a distance $x = 10cm$ from its equilibrium position at $x = 0$ on a frictionless surface from rest at $t = 0$. Write the expression for its x(t) and v(t).

A. 5 "cos" (5t)

B. 5 "sin" (5t)

C. 0.5 "cos" (5t)

D. $2 \times 10^{-2} \cos(10t)$

Answer: C

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272. A particle which is attached to a spring oscillates in a horizontal plane with a frequency of $\frac{1}{\pi} Hz$ and total energy of 5 J. What is the force constant of the spring, if its maximum speed during oscillation is 40 cm/s ?

A. $150 N/m$

B. $200 N/m$

C. $225 N/m$

D. $250N/m$

Answer: D

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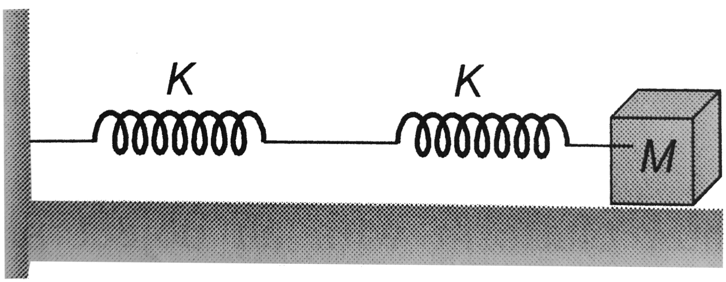
273. Two spring are connected toa block of mass M placed a frictionless surface as shown if both the spring have a spring constant k the frequency of oscillation block is



A. $\frac{1}{2\pi}\sqrt{\frac{2m}{K}}$

B. $\frac{1}{2\pi}\sqrt{\frac{m}{K}}$

C. $\frac{1}{2\pi}\sqrt{\frac{K}{2m}}$

D. $\frac{1}{2\pi}\sqrt{\frac{K}{m}}$

Answer: C

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274. A rubber band (two parallel strands of elastic material) has a force constant of 1 N/m. If the bank is cut in one place such that it now forms a "sin"gle long strand of elastic material, then the new spring constant will be

A. 5 N/m

B. 0.5 N/m

C. 0.25 N/m

D. 2 N/m

Answer: C

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275. A body of mass of 4 kg is mounted on four vertical springs each having a spring constant of 400 N/m. The period with which the body vibrates vertically is

A. 3.14 s

B. 0.314 s

C. 0.628 s

D. 0.157 s

Answer: B

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276. Three mass 0.1 kg ,0.3 kg and 0.4 kg are suspended at end of a spring. When is 0.4 kg mass is removed , the system oscillates with a period 2 s . When the 0.3 kg mass is also removed , the system will oscillates with a period

A. 1 s

B. 2s

C. 3 s

D. 4 s

Answer: A

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277. Two springs fixed at one end are stretched by 4 cm and 12 cm, respectively, when masses of 0.5 kg and 1 kg are suspended at their lower ends. They are displaced slightly from their mean positions and released. What is the ratio of their periods of oscillation ?

A. $1:\sqrt{2}$

B. $1:2$

C. $1:\sqrt{3}$

D. $2:5$

Answer: C

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278. When a spring is compressed by 0.05 m a restoring force of 10 N is developed in it. Then the force constant of the spring is

A. 50 N/m

B. 100 N/m

C. 150 N/m

D. 200 N/m

Answer: D

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279. Two identical springs, each of force constant k are connected I (a) series (b) parallel and they support a mass M. Calculate the ratio of the frequency of oscillation of the mass in two systems.

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: C

280. When a mass M is suspended from a spring, its period of oscillation is 2 second. If a mass 4 M is suspended from the same spring, then its period of oscillation will be

A. 2 sec

B. 1 sec

C. 4 sec

D. 8 sec

Answer: C

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281. What provides the restoring force for simple harmonic oscillations in the following cases? (i)simple pendulum (ii) spring (iii) column of mercury in U tube.

A. Gravitational force

B. Elasticity

C. Viscous forces

D. Centripetal force

Answer: B

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282. The time period of a mass suspended from a spring is T. If the spring is cut into four equal parts and the same mass is suspended from one of the parts, then the new time period will be

A. $\frac{T}{4}$

B. $\frac{T}{2}$

C. 2T

D. 4T

Answer: B

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283. Force constant of two wires A and B of the same material are K and $2K$ respectively. If the two wires are stretched equally, then the ratio of work done in stretching $\left(\frac{W_A}{W_B}\right)$ is

A. $w_1 = w_2$

B. $w_1 = 2w_2$

C. $w_1 = 1/2w_2$

D. $w_1 = 1/4w_2$

Answer: B

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284. A mass m is suspended from the two coupled springs connected in series. The force constant for springs are $k_1 \text{and} k_2$. The time period of the suspended mass will be

A. $T = 2\pi\sqrt{\left(\frac{m(K_1 + K_2)}{K_1 + K_2}\right)}$

B. $T = 2\pi\sqrt{\left(\frac{m}{K_1 + K_2}\right)}$

C. $T = 2\pi\sqrt{\left(\frac{mK_1 + K_2}{(K_1 + K_2)}\right)}$

D. $T = 2\pi\sqrt{\left(\frac{m}{K_1 - K_2}\right)}$

Answer: A

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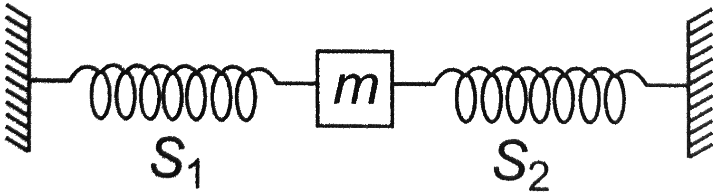
285. In figure S_1 andS_1 are identical springs. The oscillation frequency of the mass m is f. if one spring is removed, the frequency will become



A. $f \times \sqrt{2}$

B. $\frac{f}{\sqrt{2}}$

C. $f \times 2$

D. f

Answer: B

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286. The length of a spring is l and its force constant is k . When a weight W is suspended from it, its length increases by x . If the spring is cut into two equal parts and put in parallel and the same weight W is suspended from them, then the extension will be

A. $\frac{x}{4}$

B. x

C. $\frac{x}{2}$

D. 2x

Answer: A

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287. A spring of certain length and having spring constant k is cut into two pieces of length in a ratio $1:2$. The spring constants of the two pieces are in a ratio :

A. $1:2$

B. $2:3$

C. $2:1$

D. $1:3$

Answer: C

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288. Two springs have their force constants K_1 and K_2 and they are stretched to the same extension. If $K_2 > K_1$ work done is

A. More in spring B

B. Nothing can be said

C. More in spring A

D. Equal in both

Answer: C

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289. The scale of a spring balance reading from 0 to 10 kg is 0.25 m long. A body suspended from the balance oscillates vertically with a period of $\pi/10$ second. The mass suspended is (neglect the mass of the spring)

A. 20 kg

B. 10 kg

C. 0.98 kg

D. 5 kg

Answer: C

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290. Two springs with spring constants m $K_1 = 1500N/m$and m $K_2 = 3000N/m$ are stretched by the same force. The ratio of potential energy stored in spring will be

A. $1:4$

B. $4:1$

C. $2:1$

D. $1:2$

Answer: C

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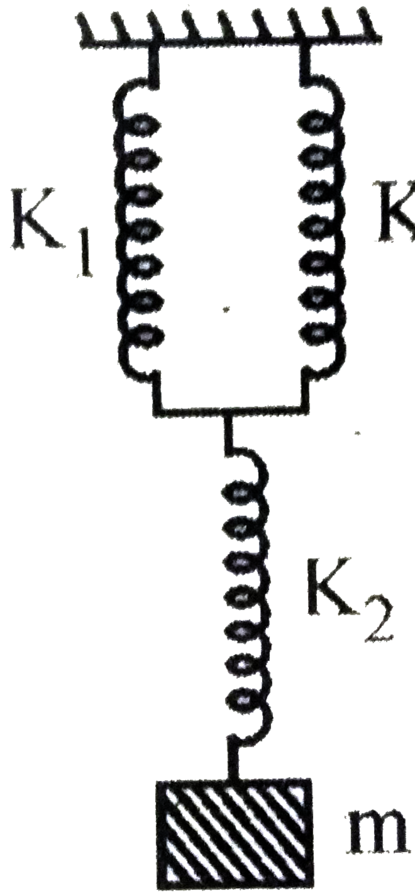
291. What will be the equivalent spring constant of the spring system shown in the figure ?



A. $\frac{1}{2K_1} + \frac{K}{K_2}$

B. $\frac{K_1}{2} + K_2$

C. $\left[\frac{2}{K_1}+\frac{1}{K_2}\right]^{-1}$

D. $\left[\frac{1}{2K_1}+\frac{1}{K_2}\right]^{-1}$

Answer: D

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292. A mass M is suspended from a light spring. An additional mass m added to it displaces the spring further by distance x then its time period is

A. $T=\left(\frac{\pi}{2}\right)\sqrt{\left(\frac{mg}{x(M+m)}\right)}$

B. $T=2\pi\sqrt{\left(\frac{(M+m)}{mgx}\right)}$

C. $T=2\pi\sqrt{\left(\frac{mg}{x(M+m)}\right)}$

D. $T = 2\pi\sqrt{\left(\frac{(M+m)x}{mg}\right)}$

Answer: D

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293. A load of mass 100 gm increases the length of wire by 10 cm. If the system is kept in oscillation, its time period is $(g = 10m/s^2)$

A. 0.314 s

B. 3.14 s

C. 0.628 s

D. 6.28 s

Answer: C

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294. When a mass of 5 kg is suspended from a spring of negligible mass and spring constant K, it oscillates with a periodic time 2π. If the mass is removed, the length of the spring will decrease by

A. $\frac{g}{K}$ metre

B. g metre

C. 2π metre

D. $\frac{m}{K}$ metre

Answer: B

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295. A mass M suspended from a spring of negligible mass executes a vertical S.H.M. of period $3\sqrt{2}$ sec. If the mass is doubled, then the ew period will be

A. 3 s

B. 6 s

C. $\frac{3}{\sqrt{2}}s$

D. $2\sqrt{3}s$

Answer: B

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296. A spring of length 0.4 m, fixed at one end in the vertical direction is extended by 5 cm, by attaching a mass of 2 kg. Then it is further pulled by 5 cm and left to itself. What is the final potential energy ? What is the amplitude of oscillation ? $\left(g = 10m / s^2\right)$

A. 2 J, 10 cm

B. 1 J, 10 cm

C. 2 J, 5 cm

D. 3 J, 10 cm

Answer: C

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297. When a mass of 1 kg is suspended from a spring, it is stretched by 0.4m. A mass of 0.25 kg is suspended from the spring and the spring is allowed to oscillate. If $g = 10m/s^2$, then its period of oscillation will be

A. 0.5 sec

B. 0.4 sec

C. 0.628 sec

D. 1.5 sec

Answer: C

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298. A mass M attached to a spring oscillates with a period of 1s. If the mass is increased by 3 kg the period increases by 1s. What is the value of M, assuming that Hooke's law is obeyed ?

A. 3 kg

B. 2 kg

C. 1 kg

D. 5 kg

Answer: C

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299. A mass is suspended from a spring having spring constant k is displaced veritcally and relased. It oscillates with period T the weight of the mass suspended is (g= gravitatioanal acceleration)

A. $\frac{KTg}{4\pi^2}$

B. $\frac{KT^2g}{4\pi^2}$

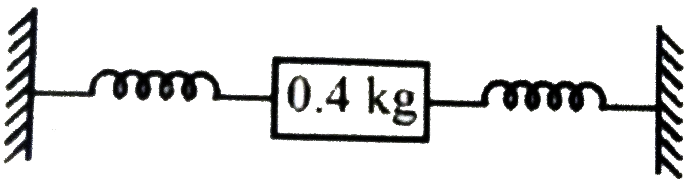
C. $\frac{KTg}{2\pi^2}$

D. $\frac{KT^2g}{2\pi^2}$

Answer: B

Watch Video Solution

300. A body of mass 0.4 kg is held between two massless springs whose ends are fixed to rigid walls as shown in the figure. The spring constants are 8 N/m and 2 N/m. If the body is displaced along the direction of the lengths of the springs and released, the time period (in second) of the oscillations will be (ignore vertical oscillation, if any)



A. 2π

B. 4π

C. 0.2π

D. 0.4π

Answer: D

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301. Which of the following graph depicts spring constant k versus length l of the spring correctly

A. a straight line

B. an ellipse

C. a parabola

D. a hyperbola

Answer: D

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302. A spring has length'l' and spring constant 'k'. It is cut into two pieces of lengths l_1 and l_2 such that $l_1 = nl_2$. The force constant of the spring of length l_1 is

A. $\left(\frac{n+1}{n}\right)K$

B. K

C. $\frac{K}{n+1}$

D. K(1+n)

Answer: A

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303. When a mass m is attached to a spring, it normally extends by 0.2 m . The mass m is given a slight addition extension and released, then its time period will be

A. $\frac{2\pi}{7}$ sec

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

C. 1 sec

D. $\frac{1}{7}$ sec

Answer: A

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304. A flat spiral spring of force constant K is loaded with mass M and oscillates vertically with a time period T. Then the mass suspended to the free end is

A. $\frac{4\pi^2}{KT^2}$

B. $\frac{KT^2}{4\pi^2}$

C. $\frac{KT}{4\pi^2}$

D. $\frac{KT}{4\pi}$

Answer: B

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305. If a spring has time period T, and is cut into (n) equal parts, then the time period of each part will be.

A. nT

B. $\frac{T}{\sqrt{n}}$

C. $T\sqrt{n}$

D. T

Answer: B

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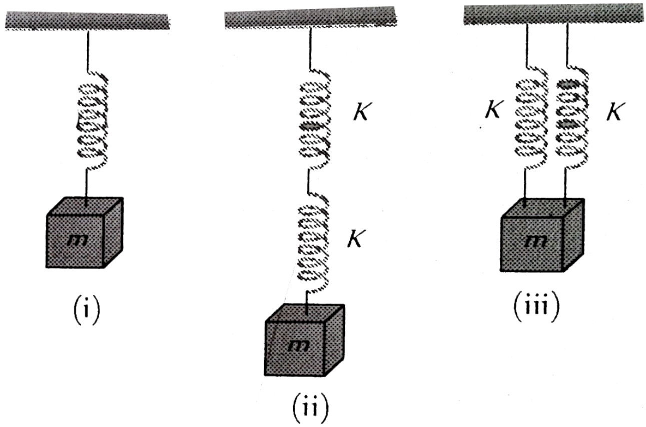
306. Five identical springs are used in the following three configurations. The time periods of vertical oscillations in configurations (i), (ii) and (iii) are in the ratio



A. $\frac{1}{\sqrt{2}}:2:1$

B. $2:\sqrt{2}:\frac{1}{\sqrt{2}}$

C. $2:\frac{1}{\sqrt{2}}:1$

D. $1:\sqrt{2}:\frac{1}{\sqrt{2}}$

Answer: D

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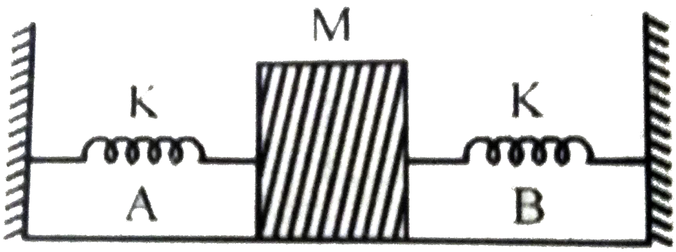
307. Two identical springs A and B each of spring constant K are attached to a block of mass M and to two fixed supports as shown in the figure. When the mass M is displaced through a small dis"tan"ce from its equilibrium position, it executes a S.H.M. What is its frequency of oscillation ?



A. $n = \frac{1}{2\pi}\sqrt{\frac{K}{M}}$

B. $n = \frac{1}{2\pi}\sqrt{\frac{K}{2M}}$

C. $n = \frac{1}{2\pi}\sqrt{\frac{2K}{M}}$

D. $n = \frac{1}{2\pi}\sqrt{\frac{K^2}{M}}$

Answer: C

View Text Solution

308. Two bodies P and Q of equal masses are suspended from two separate massless springs of force constants k_1 and k_2 respectively. If the two bodies oscillate vertically such that their maximum velocities are equal. The ratio of the amplitude of P to that of Q is

A. $\frac{K_2}{K_1}$

B. $\sqrt{\frac{K_1}{K_2}}$

C. $\frac{K_1}{K_2}$

D. $\sqrt{\frac{K_2}{K_1}}$

Answer: D

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309. 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. $\frac{Mg}{K}$

B. $\frac{Mg}{2K}$

C. $\frac{4Mg}{K}$

D. $\frac{2Mg}{K}$

Answer: D

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310. A spring of force constant k is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of:

A. 2K

B. 3K

C. $\frac{3}{2}K$

D. $\frac{2}{3}K$

Answer: C

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311. A spring executes SHM with mass of 10 kg attached to it. The force constant of spring is 10 N/m. If at any instant its velocity is 40 cm/sec, the displacement will be (where amplitude is 0.5 m)

A. 0.3 m

B. 0.9 m

C. 0.03 m

D. 0.09 m

Answer: A

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312. A mass M is suspended from a spring of negligible mass. The spring is pulled a little then released, so that the mass executes simple harmonic motion of time period T. If the mass is increased by m, the time period becomes $\frac{5T}{3}$. Find the ratio of m/M.

A. $\frac{9}{16}$

B. $\frac{25}{16}$

C. $\frac{4}{5}$

D. $\frac{5}{4}$

Answer: A

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313. A spring balance having a scale of length 10 cm is used to measure weights from 0 to 5 kg. When a small stone of mass m is suspended from the spring, the spring performs 50 vertical oscillation in 10 second. What is the mass of the stone ? [use $g = 10 m/s^2$ and $\pi^2 = 10$].

A. 100 gram

B. 250 gram

C. 500 gram

D. 750 gram

Answer: C

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314. A mass m suspended from a vertical spring oscillates with a period of 4 s. The mass is then kept at rest. Through what dis"tan"ce the spring will be stretched ? [Take `pi^(2)=10]

A. 3 m

B. 4 m

C. 5 m

D. 6 m

Answer: B

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315. A particle at the end of a spring executes simple harmonic motion with a period t_1 while the corresponding period for another spring is t_2 if the oscillation with the two springs in series is T then

A. $T = T_1 + T_2$

B. $T^2 = T_1^2 + T_2^2$

C. $\frac{1}{T^2} = \frac{1}{T_1^2} + \frac{1}{T_2^2}$

D. $\frac{1}{T} = \frac{1}{T_1} + \frac{1}{T_2}$

Answer: B

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316. A block of mass m, attacted to a string of spring constant k, oscillates on a smooth horizontal table. The other end of the spring is fixed to a wall. The block has a speed v when the spring is at its natural length. Before coming to an instantaneous rest. If the block moves a distance x from the mean position, then

A. $x = \sqrt{\frac{mv}{K}}$

B. $x = v\sqrt{\frac{m}{K}}$

C. $x = \frac{1}{v}\sqrt{\frac{m}{K}}$

D. $x = \sqrt{\frac{m}{K}}$

Answer: B

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317. The force constants of two springs areK_1 and K_2. Both are stretched till their elastic energies are equal. If the stretching forces are F_1 and $F_2 then F_1 : F_2$ is

A. $\sqrt{K_1} : \sqrt{K_2}$

B. $K_2 : K_1$

C. $K_1^2 : K_2^2$

D. $K_1 : K_2$

Answer: A

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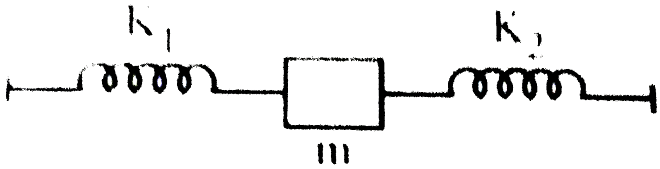
318. Two springs of force constants K_1 and K_2 are connected to a mass m as shown I the figure.



If both K_1 and K_2 are made four times their original values, the frequency of oscillation becomes,

A. 2f

B. 4f

C. $\frac{f}{2}$

D. $\frac{f}{4}$

Answer: A

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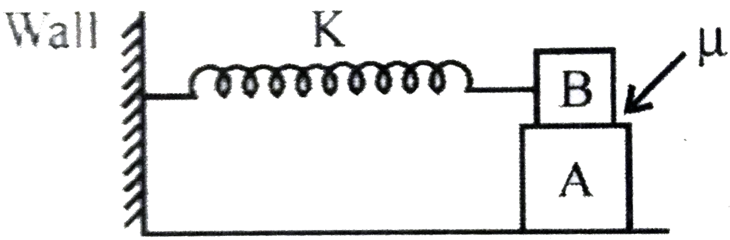
319. A block A of mass m is placed on a frictionless horizontal surface. Another block B of the same mass is kept on A and connected to the wall with the helpf of a spring of force constant K as shown in the figure. The coefficient of friction between the blocks A and B is μ. The blocks move together execting simple harmonic motion of amplitude 'a'. What is the maximum value of the fricitional force between A and B ?



A. μ mg

B. zero

C. Ka

D. $\frac{Ka}{2}$

Answer: D

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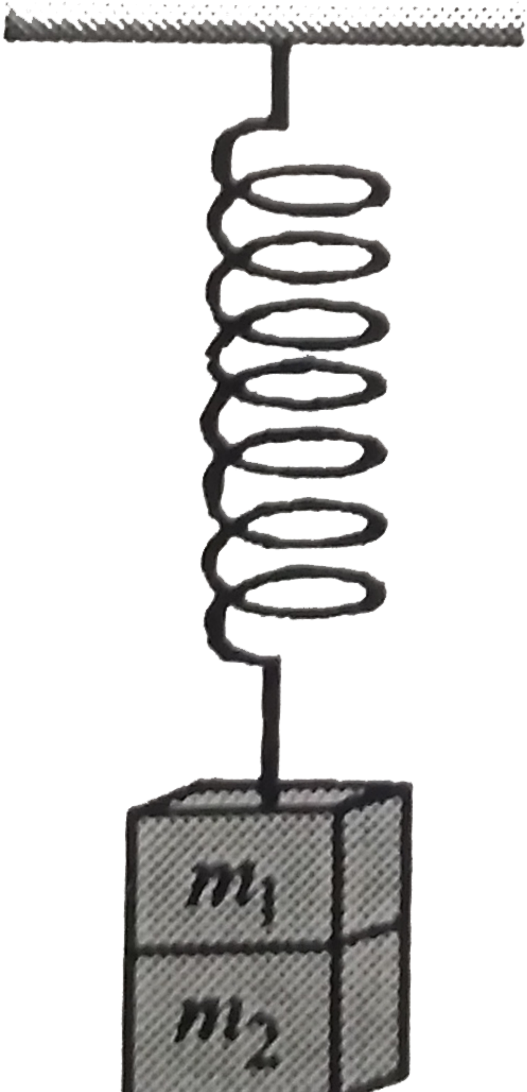
320. Two masses m1 and m2 are suspended together by a massless spring of constant k. When the masses are in equilibrium, m1 is removed without disturbing the system. The amplitude of oscillations is



A. $\frac{m_2 g}{K}$

B. $\frac{m_1 g}{K}$

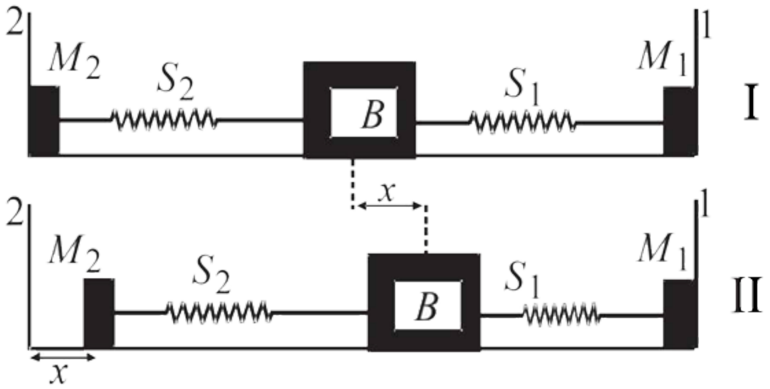
C. $\frac{K}{m_1 g}$

D. $\frac{K}{m_2 g}$

Answer: B

Watch Video Solution

321. A block (B) is attached to two unstriched sprig S_1 and S_(2) with spring constant K and $4K$, respectively (see fig 1) The other ends are atteched in identical support M_1 and M_2 not attached in the walls . The springs and supports have negligible mass . There is no friction anywhere . The block B is displaced toword wall 1 by a small distance z (figure (ii)) and released . THe block return and moves a maximum displacements x and y are musured with reoact to the equalibrum of the block B and the ratio y/x is



A. 4

B. 2

C. $\frac{1}{2}$

D. $\frac{1}{4}$

Answer: C

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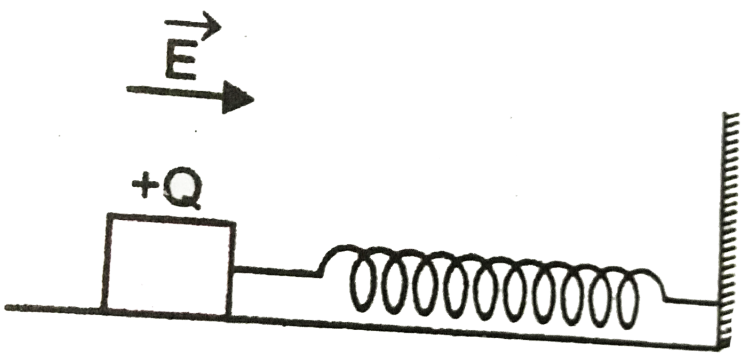
322. A wooden block performs SHM on a frictionless surface with frequency, v_0. The block carries a charge $+Q$ on its surface. If now a uniform electric field $\vec{E}$ is switched on as shwon in figure., then the SHM of the block will be



A. of the same frequency and with shifted mean position

B. of the same frequency and with the same mean position

C. of changed frequency and with shifted mean position

D. of changed frequency and with the same mean position

Answer: A

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323. Two similar springs P and Q have spring constant K_P and K_Q such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then the same force (case b). The work done by the spring W_P and W_Q are related as, in case (b), respectively

A. $W_P = W_Q, W_P = W_Q$

B. $W_P > W_Q, W_Q > W_P$

C. $W_p < W_Q, W_Q < W_P$

D. $W_p = W_Q, W_P > W_Q$

Answer: B

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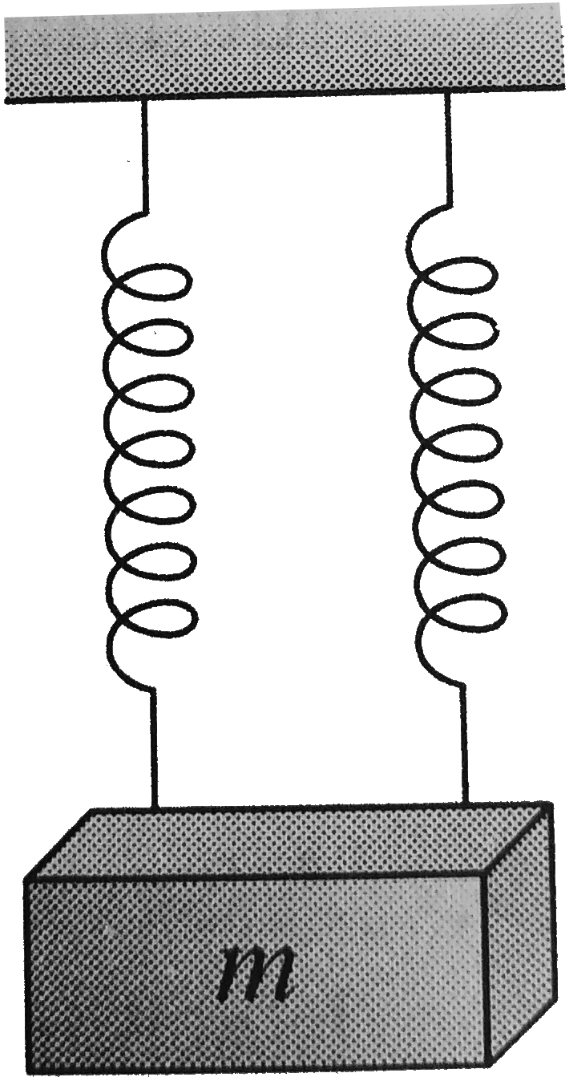
324. A mass m is suspended separately by two different spring of spring constant K_1 and k_2 given the time period t_1 andt_2 respectively if the same mass m is shown in the figure then time period t is given by the relation



A. $t = \frac{t_1 t_2}{t_1 + t_2}$

B. $t^2 = t_1^2 + t_2^2$

C. $t = t_1 + t_2$

D. $t^{-2} = t_1^{-2} + t_2^{-2}$

Answer: D

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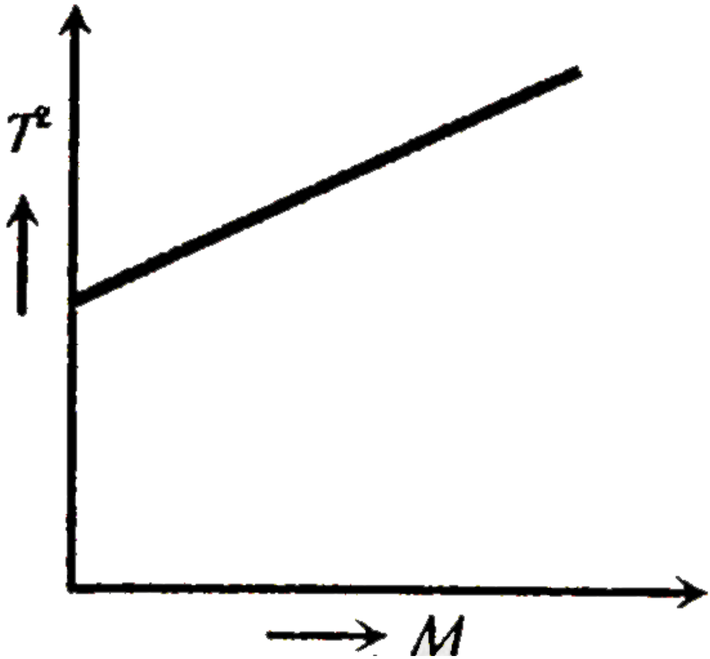
325. The graph shown was obtained from experimental measurements of the period of oscillations T for different masses M placed in the scale pan on the lower end of the spring balance. The most likely reason for the line not passing through the origin is that the



A. Stopclock was not regulated

B. Spring did not obey Hook's law

C. Mass of the pan was not taken into account

D. Amplitude of the oscillations was too large

Answer: C

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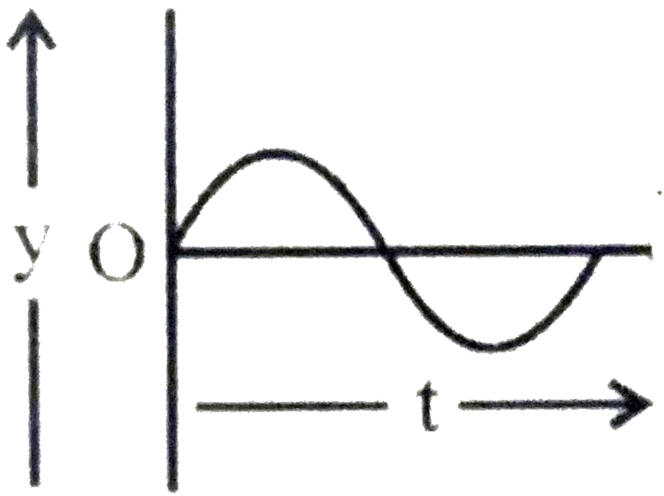
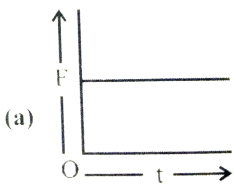
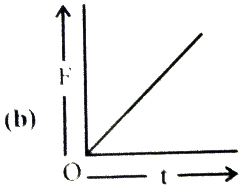
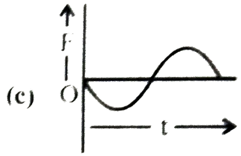
326. The displacement-time graph of a particle executing simple harmonic motion is shown in the figure

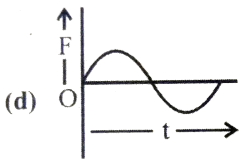


Which one of the following graphs is the correct forcetime graph for the motion of the particle ?

A. 

B. 

C. 

D. 

Answer: C

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327. The graph of l against T for a simple pendulum is

A. a curve

B. a straight line

C. a parabola

D. an ellipse

Answer: C

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328. The period (T) of a simple pendulum is measured for different length (L), then graph of Log T against log L is

A. a parabola

B. a circle

C. a straight line with a slope $\frac{1}{2}$

D. a straight line with a slope 2

Answer: C

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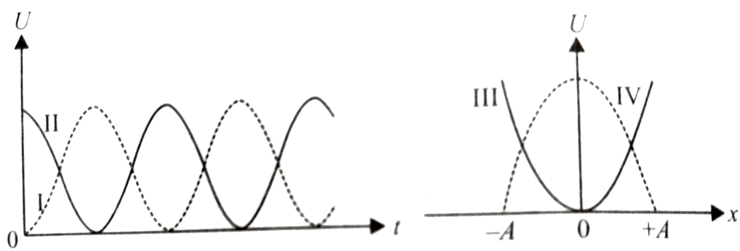
329. For a particle executing simple harmonic motion, the displacement x is given by x=$A\cos\omega t$. Identify the graph, which represents the variation of potential energy (U) as a function of time t and displacement x.



A. I, IV

B. I, III

C. II, IV

D. II, III

Answer: B

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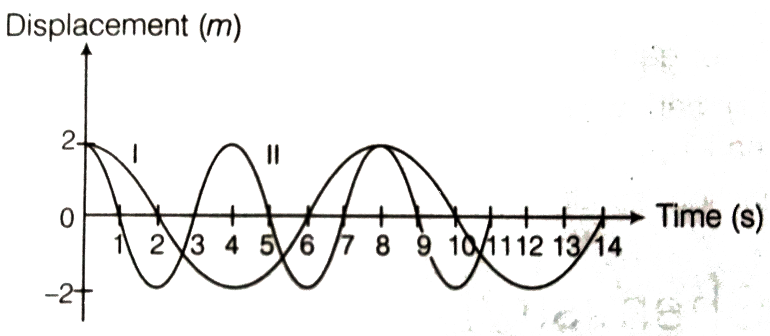
330. Figure shows the displacement time graphs of two simple harmonic motions I and II. From the graph it follows that



A. curve I has same frequency as that of curve II

B. curve I has a frequency twice that of curve II

C. curve I has a frequency half that of cure II

D. curve I has frequency four times that of curve II

Answer: C

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331. A particle executing linear SHM has velocities v_1 and v_2 at dis"tan"ce x_1 and x_2, respectively from the mean position. The angular velocity of the particle is

A. $\sqrt{\dfrac{x_1^2 - x_2^2}{v_2^2 - v_1^2}}$

B. $\sqrt{\dfrac{v_2^2 - v_1^2}{x_1^2 - x_2^2}}$

C. $\sqrt{\dfrac{x_1^2 + x_2^2}{v_2^2 + v_1^2}}$

D. $\sqrt{\dfrac{v_2^2 + v_1^2}{x_1^2 + x_2^2}}$

Answer: B

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332. If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will

A. increase

B. remain the same

C. decrease

D. first increase and then decrease

Answer: B

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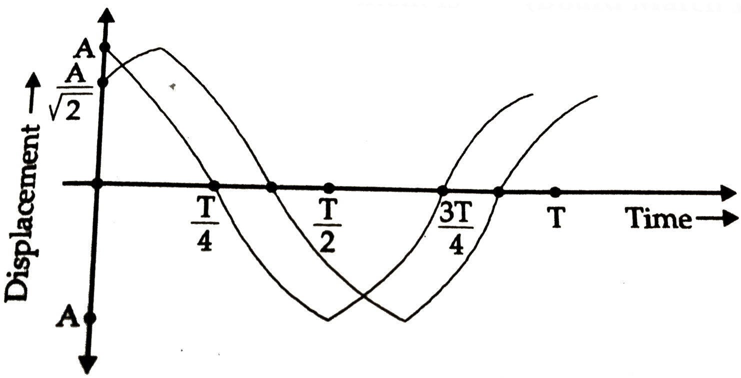
333. Two particles perform linear simple harmonic motion along the same path of length 2 A and period T as shown in the graph below. The phase difference between them is



A. Zero rad

B. $\frac{\pi}{4}$ rad

C. $\frac{\pi}{2}rad$

D. $\frac{3\pi}{4}rad$

Answer: B

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334. The average displacement over a period of SHM is ____ (A = amplitude of SHM)

A. 0

B. A

C. 2A

D. 4A

Answer: A

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335. A particle executing SHM. The phase difference between acceleration and displacement is

A. $\frac{\pi}{2}$ rad

B. πrad

C. $2\pi rad$

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

Answer: B

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336. Two springs have their force constants K_1 and K_2 and they are stretched to the same extension. If $K_2 > K_1$ work done is

A. $W_1 = W_2$

B. $W_1 < W_2$

C. $W_1 > W_2$

D. $W_1 = W_2 = 0$

Answer: B

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337. A mass m_1 connected to a horizontal spring performs a S.H.M. with an amplitude A. While the mass m_1 is pas"sin"g through the mean position, another mass m_2 is placed on it so that both the masses move together with amplitude A_1. The ratio of $\frac{A_1}{A}$ is $(m_2 < m_1)$.

A. $\left[\frac{m_1}{m_1 + m_2}\right]^{1/2}$

B. $\left[\frac{m_1 + m_2}{m_1}\right]^{1/2}$

C. $\left[\frac{m_2}{m_1 + m_2}\right]^{1/2}$

D. $\left[\frac{m_1 + m_2}{m_2}\right]^{1/2}$

Answer: A

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338. The bob of a simple pendulum performs SHM with period T in air and with period T_1 in water. Relation between T and T_1 is (neglect friction due to water, density of the material of the bob is = $\frac{9}{8} \times 10^3 \frac{kg}{m^3}$, density of water = $10^3 \frac{kg}{m^3}$)

A. $T_1 = 3T$

B. $T_1 = 2T$

C. $T_1 = T$

D. $T_1 = \frac{T}{2}$

Answer: A

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339. Which of the following quantity does not change due to damping of oscillations?

A. Angular frequency

B. Time period

C. Initial phase

D. Amplitude

Answer: C

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340. A simple pendulum of length l has a maximum angular displacement θ. The maximum kinetic energy of the bob of mass m will be

A. $mgl(1+\cos\theta)$

B. $mg\left(1+\cos^2\theta\right)$

C. $mgl(1-\cos\theta)$

D. $mgl(\cos\theta-1)$

Answer: C

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341. A particle performing SHM starts equilibrium position and its time period is 16 seconds. After 2 seconds its velocity is $\pi m / s$. Amplitude of oscillation is $\left(\cos 45^{\circ}=\frac{1}{\sqrt{2}}\right)$

A. $2\sqrt{2}m$

B. $4\sqrt{2}m$

C. $6\sqrt{2}m$

D. $8\sqrt{2}m$

Answer: D

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342. A particle performing SHM starting extreme position. Graphical repersentation shows that, between displacement and acceleration , there is a phase difference of

A. 0 rad

B. $\frac{\pi}{4} rad$

C. $\frac{\pi}{2} rad$

D. πrad

Answer: D

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343. A simple pendulum of length 'L' has mass 'M' and it oscillates freely with amplitude energy is

(g = acceleration due to gravity)

A. $\frac{MgA^2}{2L}$

B. $\frac{MgA}{2L}$

C. $\frac{MgA^2}{L}$

D. $\frac{2MgA^2}{L}$

Answer: A

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344. A particle executes a linear SHM. In two of its positions the velocities are u and v and the corresponding acceleration are α and β respectively $(0 < \alpha < \beta)$. What is the distance between the positions ?

A. $\dfrac{u^2 - v^2}{\alpha + \beta}$

B. $\dfrac{u^2 + v^2}{\alpha + \beta}$

C. $\dfrac{u^2 - v^2}{\alpha - \beta}$

D. $\dfrac{u^2 + v^2}{\alpha - \beta}$

Answer: A

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345. We draw the reference circle of a particle (M) performing a linear S.H.M. If the period of M is 2 sec, then the angular velocity of the reference particle will be

A. 2π radian/sec

B. $\frac{\pi}{2}$ radian/sec

C. π radian/sec

D. $\frac{3\pi}{2}$ radian/sec

Answer: C

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346. Which of the following expressions does not represent a simple hormonic motion ?

A. $x = A\tan(\omega t + \phi)$

B. $x = A\sin(\omega t + \delta)$

C. $x = A\sin\omega t\cos\omega t$

D. $x = B\cos(\omega t + \phi)$

Answer: A

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347. The displacement of a particle performing a S.H.M. is given by $x = 0.5\sin 100\pi(t + 0.05)$, where x is in metres and t is in second. Its periodic time in second is

A. 0.01s

B. 0.02s

C. 0.1s

D. 0.5s

Answer: B

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348. The displacement of a particle executing a S.h.M. at any ins"tan"t t is $x = 4\sin(2\pi t)$. The acceleration produced in the particle is given by

A. $-16\pi^2 \sin 2\pi t$

B. $-16\pi^2 \cos 2\pi t$

C. $12\pi \cos 2\pi t$

D. $16\pi \sin(2\pi)^2 t$

Answer: A

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349. The displacement of a particle executiing a linear S.H.M. is given by

x=0.5 "sin" [44 t+ 0.25] metre.

Then the period and the maximum velocity of the partile are given by

A. $\frac{1}{3}s, 44m/s$

B. $\frac{1}{5}s, 66m/s$

C. $\frac{1}{7}s, 22m/s$

D. $\frac{1}{2}s, 33m/s$

Answer: C

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350. A horizontal platform with a small object placed on it executes a linear SHM in the vertical direction. The amplitude of oscillation is 40 cm. What should be the least period of these oscillation, so that the object is not detached from the platform ? [Use $g = 10m/s^2$]

A. $0.2\pi s$

B. $0.3\pi s$

C. $0.4\pi s$

D. $0.5\pi s$

Answer: C

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351. A particle is executing a linear S.H.M. Its velocity at a dis"tan"ce x from the mean position is given by

$v^2 = 144 - 9x^2$. [x is in metre]

What is the amplitude of S.H.M. ?

A. 2m

B. 4m

C. 3m

D. 5m

Answer: B

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352. The periodic time of a particle performing a linear S.H.M. is 12 sec. It starts from the mean position. After 2 seconds, its velocity is found to be $\pi cm / \sec$. What is the amplitude of S.H.M. ?

A. 4cm

B. 8cm

C. 12 cm

D. 16cm

Answer: C

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353. A particle exectues a linear S.H.M. of amplitude 2 cm. When it is at 1cm from the mean position, the magnitudes of its velocity and acceleration are equal. What is its maximum velocity ? $[\sqrt{3} = 1.732]$

A. $2.5 cm / s$

B. $1.4 cm / s$

C. $3.464 cm / s$

D. $4.322 cm / s$

Answer: C

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354. A particle performs a S.H.M. and starts from the mean position. The graph of restoring force against time for the particle is a

A. straight line

B. circle

C. sine curve

D. cosine curve

Answer: C

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355. The displacement of a particle performing S.H.M. is given by $x = 10\sin(\omega t + \alpha)$ metre. If the displacement of the particle is 5m, then the phase of S.H.M. is

A. $\frac{\pi}{3}$ radian

B. $\frac{\pi}{6}$ radian

C. $\frac{\pi}{4}$ radian

D. $\frac{\pi}{2}$ radian

Answer: B

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356. The phase of a particle performing a linear S.H.M. increases by $\frac{\pi}{4}$ after every 5 sec. What is the frequency of its oscillation ?

A. $\frac{1}{10}Hz$

B. $\frac{1}{20}Hz$

C. $\frac{1}{30}Hz$

D. $\frac{1}{40}Hz$

Answer: D

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357. What is the relation between the potential energy and total energy (E) of a particle performing a S.H.M., when it is at half way between the mean and extreme positions ?

A. P.E. =E

B. $P.E. = \frac{E}{2}$

C. $P.E. = \frac{E}{4}$

D. $P.E. = \frac{3}{4}E$

Answer: C

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358. When the displacement of a simple harmonic oscillator is half of its amplitude, its potential energy is 3J. Its total energy is

A. 6J

B. 12 J

C. 15 J

D. 20 J

Answer: B

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359. For a linear harmonic oscillator, its potential energy, kinetic energy and total energy given by E_P, K_K and E_T respectively. Its maximum acceleration is given by

A. $\sqrt{\frac{2E_P}{m}}$

B. $\sqrt{\frac{2E_K}{m}}$

C. $\sqrt{\frac{2E}{mA}}$

D. $\frac{2E}{mA}$

Answer: D

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360. The length of a second's pendulum on the surface of the earth, where $g = 9.8m/s^2$, is approximately equal to

A. 0.8 m

B. 1 m

C. 1.2m

D. 1.1 m

Answer: B

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361. A simple pendulum is suspended from the ceilling of a left. When the lift is at rest, its time period is T. With what accleration should lift be acclerated upwards in order to reduce its time period to $\frac{T}{2}$.

A. g

B. 2g

C. 3g

D. $-2g$

Answer: C

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362. What is the relation between the period T_s and T_e of a simple pendulum and a conical pendulum respectively, if they have the same length ?

A. $T_e = T_s$

B. $T_e > T_s$

C. $T_e / 2T_s$

D. $T_e < T_s$

Answer: D

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363. A simple pendulum attached to the ceiling of a stationary lift has a time period T. The distance y covered by the lift moving upwards varies with time t as $y = t^2$ where y is in metres and t in seconds. If $g = 10m / s^2$, the time period of pendulum will be

A. $\sqrt{\frac{4}{5}}T$

B. $\sqrt{\frac{5}{6}}T$

C. $\sqrt{\frac{5}{4}}T$

D. $\sqrt{\frac{6}{5}}T$

Answer: B

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364. The amplitude of a damped oscillator becomes $\frac{1}{(27)^{th}}$ of its initial value after 6 minutes. Its amplitude after 2 minutes is

A. $\frac{A_0}{6}$

B. $\frac{A_0}{9}$

C. $\frac{A_0}{4}$

D. $\frac{A_0}{3}$

Answer: D

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365. A simple pendulum is vibrating in an evacuated chamber, it will oscillate with

A. Increa"sin"g amplitude

B. Decrea"sin"g amplitude

C. Cons"tan"t amplitude

D. First (b) then (a)

Answer: C

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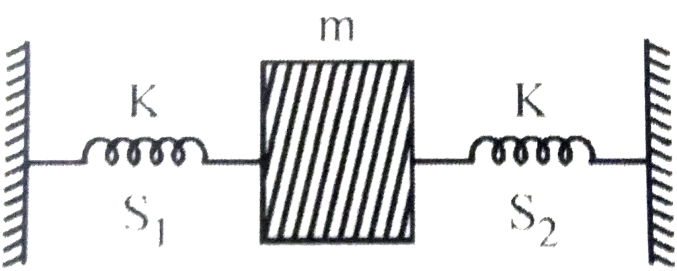
366. Two identical springs S_1 and S_2 are joined as shown in the figure. The oscillation frequency of the mass m is v. What will be the frequency of mass m, if one spring is removed ?



A. $\sqrt{2}v$

B. v

C. $\frac{v}{\sqrt{2}}$

D. $2v$

Answer: C

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367. A toy used for firing a ball vertically consists of a vertical spring which is compressed by 0.1 m by u"sin"g a force of 10 N. A ball of mass 0.050 kg is placed on the compressed spring and the spring is released. The ball will reach a height of (Use $g = 10m/s^2$)

A. 0.5 m

B. 0.75 m

C. 1 m

D. 1.25 m

Answer: C

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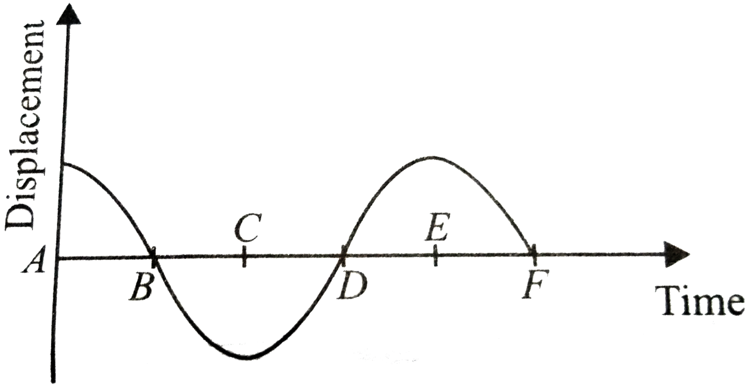
368. displacement versus time curve for a particle executing SHM is is as shown in figure.



At what points the velocity of the particle is zero?

A. A,C,E

B. B,D,F

C. A,D,F

D. C,E,F

Answer: A

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