DDS ACADEMY

OCILLATIONS DPP-4 **JEE-MAINS/NEET**

Simple Pendulum

1. The period of a simple pendulum is doubled, when

(a) Its length is doubled

(b) The mass of the bob is doubled

(c) Its length is made four times

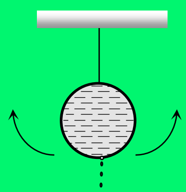
(d) The mass of the bob and the length of the pendulum are doubled

2. The period of oscillation of a simple pendulum of constant length at earth surface is T. Its period inside a mine is

(a) Greater than T (b) Less than T

(c) Equal to T (d) cannot be compared

3. A simple pendulum is made of a body which a hollow sphere is containing mercury suspended by means of a wire. If a little mercury is drained off, the period of pendulum will



(a) Remains unchanged

(b) Increase

(c) Decrease

(d) Become erratic

4. A pendulum suspended from the ceiling of a train has a period T, when the train is at rest. When the train is accelerating with a uniform acceleration a, the period of oscillation will

(a) Increase (b) Decrease

(c) Remain unaffected (d) Become infinite

5. The mass and diameter of a planet are twice those of earth. The period of oscillation of pendulum on this planet will be (If it is a second's pendulum on earth)

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

(c) 2 *sec* (d) $\frac{1}{2}$ *sec*

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

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

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

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

7. Which of the following statements is not true? In the case of a simple pendulum for small amplitudes the period of oscillation is

(a) Directly proportional to square root of the length of the pendulum

(b) Inversely proportional to the square root of the acceleration due to gravity

(c) Dependent on the mass, size and material of the bob

(d) Independent of the amplitude

8. The time period of a second's pendulum is 2 *sec*. The spherical bob which is empty from inside has a mass of 50 *gm*. This is now replaced by another solid bob of same radius but having different mass of 100 *gm*. The new time period will be

(a) 4 *sec* (b) 1 *sec*

(c) 2 *sec* (d) 8 *sec*

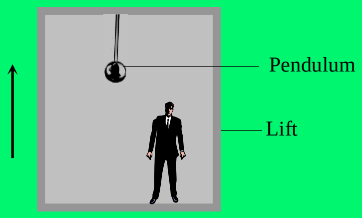
9. A man measures the period of a simple pendulum inside a stationary lift and finds it to be T sec. If the lift accelerates upwards with an acceleration $g/4$, then the period of the pendulum will be

(a) T

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

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

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



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

(a) g (b) $g-a$

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

11. 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) Zero (b) $2\sqrt{3}$ *sec*

(c) 4 *sec* (d) Infinite

12. The bob of a simple pendulum of mass m and total energy E will have maximum linear momentum equal to

(a) $\sqrt{\frac{2E}{m}}$ (b) $\sqrt{2mE}$

(c) $2mE$ (d) mE^2

13. The length of the second pendulum on the surface of earth is 1 m. The length of seconds pendulum on the surface of moon, where g is 1/6th value of g on the surface of earth, is

(a) $1/6\ m$ (b) $6\ m$

(c) $1/36\ m$ (d) $36\ m$

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

(a) 3927 *sec* (b) 3727 *sec*

(c) 3427 *sec* (d) 864 sec

15. The period of simple pendulum is measured as T in a stationary lift. If the lift moves upwards with an acceleration of 5 g, the period will be

(a) The same (b) Increased by 3/5

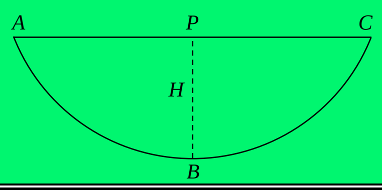
(c) Decreased by 2/3 times (d) None of the above

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

(a) Increase by 1% (b) Increase by 0.5%

(c) Decrease by 0.5% (d) Increase by 2%

17. A simple pendulum with a bob of mass *'m'* oscillates from A to C and back to A such that PB is H. If the acceleration due to gravity is *'g'*, then the velocity of the bob as it passes through B is



(a) mgH (b) $\sqrt{2gH}$

(c) $2gH$ (d) Zero

18. Identify correct statement among the following

(a) The greater the mass of a pendulum bob, the shorter is its frequency of oscillation

(b) A simple pendulum with a bob of mass M swings with an angular amplitude of 40^o. When its angular amplitude is 20^o, the tension in the string is less than $Mg\cos 20^o$.

(c) As the length of a simple pendulum is increased, the maximum velocity of its bob during its oscillation will also decreases

(d) The fractional change in the time period of a pendulum on changing the temperature is independent of the length of the pendulum

19. 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) $\sqrt{2gl(1-\sin\theta)}$ (b) $\sqrt{2gl(1+\cos\theta)}$

(c) $\sqrt{2gl(1-\cos\theta)}$ (d) $\sqrt{2gl(1+\sin\theta)}$

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

(a) Its periodic time decreases

(b) Its periodic time increases

(c) It does not oscillate at all

(d) None of these

21. A pendulum bob has a speed of 3 m/s at its lowest position. The pendulum is 0.5 m long. The speed of the bob, when the length makes an angle of 60^o to the vertical, will be (If $g = 10 m/s^2$)

(a) $3m/s$ (b) $\frac{1}{3}m/s$

(c) $\frac{1}{2}m/s$ (d) $2m/s$

22. The time period of a simple pendulum is 2 *sec*. If its length is increased 4 times, then its period becomes

(a) 16 *sec* (b) 12 *sec*

(c) 8 *sec* (d) 4 *sec*

23. If the metal bob of a simple pendulum is replaced by a wooden bob, then its time period will

(a) Increase

(b) Decrease

(c) Remain the same

(d) First increase then decrease

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

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

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

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

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

(c) $T^{1/3}$ (d) $\sqrt{2}$ T

26. A simple pendulum is executing simple harmonic motion with a time period T. If the length of the pendulum is increased by 21%, the percentage increase in the time period of the pendulum of increased length is

(a) 10% (b) 21%
(c) 30% (d) 50%

27. If the length of simple pendulum is increased by 300%, then the time period will be increased by
(a) 100% (b) 200%
(c) 300% (d) 400%

28. The length of a seconds pendulum is
(a) 99.8 *cm* (b) 99 *cm*
(c) 100 *cm* (d) None of these

29. The time period of a simple pendulum in a lift descending with constant acceleration g is
(a) $T = 2\pi\sqrt{\frac{l}{g}}$ (b) $T = 2\pi\sqrt{\frac{l}{2g}}$
(c) Zero (d) Infinite

30. A chimpanzee swinging on a swing in a sitting position, stands up suddenly, the time period will
(a) Become infinite (b) Remain same
(c) Increase (d) Decrease

31. The acceleration due to gravity at a place is $\pi^2\, m/sec^2$. Then the time period of a simple pendulum of length one *metre* is
(a) $\frac{2}{\pi} sec$ (b) $2\pi\, sec$
(c) $2\, sec$ (d) $\pi\, sec$

32. A plate oscillated with time period 'T'. Suddenly, another plate put on the first plate, then time period
(a) Will decrease (b) Will increase
(c) Will be same (d) None of these

33. 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 $2T$, then new length is
(a) $2\, l$ (b) $4\, l$
(c) $4\, l\, x$ (d) $\frac{4l}{x}$

34. In a second's pendulum, mass of bob is 30 *gm*. If it is replaced by 90 *gm* mass. Then its time period will
(a) 1 *sec* (b) 2 *sec*
(c) 4 *sec* (d) 3 *sec*

35. The time period of a simple pendulum when it is made to oscillate on the surface of moon
(a) Increases (b) Decreases
(c) Remains unchanged (d) Becomes infinite

36. A simple pendulum is attached to the roof of a lift. If time period of oscillation, when the lift is stationary is T. Then frequency of oscillation, when the lift falls freely, will be
(a) Zero (b) T
(c) $1/T$ (d) None of these

37. A simple pendulum, suspended from the ceiling of a stationary van, has time period T. If the van starts moving with a uniform velocity the period of the pendulum will be
(a) Less than T (b) Equal to $2T$
(c) Greater than T (d) Unchanged

38. If the length of the simple pendulum is increased by 44%, then what is the change in time period of pendulum
(a) 22% (b) 20%

(c) 33% (d) 44%

39. To show that a simple pendulum executes simple harmonic motion, it is necessary to assume that

(a) Length of the pendulum is small

(b) Mass of the pendulum is small

(c) Amplitude of oscillation is small

(d) Acceleration due to gravity is small

40. 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) $5.4\ m/s$ (b) $4.95\ m/s$

(c) $3.14\ m/s$ (d) Zero

41. The amplitude of an oscillating simple pendulum is 10*cm* and its period is 4 *sec*. Its speed after 1 *sec* after it passes its equilibrium position, is

(a) Zero (b) $0.57\,m/s$

(c) $0.212\,m/s$ (d) $0.32\,m/s$

42. A simple pendulum consisting of a ball of mass *m* tied to a thread of length *l* is made to swing on a circular arc of angle θ in a vertical plane. At the end of this arc, another ball of mass *m* is placed at rest. The momentum transferred to this ball at rest by the swinging ball is

(a) Zero (b) $m\theta\sqrt{\frac{g}{l}}$

(c) $\frac{m\theta}{l}\sqrt{\frac{l}{g}}$ (d) $\frac{m}{l}2\pi\sqrt{\frac{l}{g}}$

43. A simple pendulum hangs from the ceiling of a car. If the car accelerates with a uniform acceleration, the frequency of the simple pendulum will

(a) Increase (b) Decrease

(c) Become infinite (d) Remain constant

44. The periodic time of a simple pendulum of length 1 *m* and amplitude 2 *cm* is 5 seconds. If the amplitude is made 4 *cm*, its periodic time in seconds will be

(a) 2.5 (b) 5

(c) 10 (d) $5\sqrt{2}$

45. The ratio of frequencies of two pendulums are 2 : 3, then their length are in ratio

(a) $\sqrt{2/3}$ (b) $\sqrt{3/2}$

(c) $4/9$ (d) $9/4$

46. Two pendulums begin to swing simultaneously. If the ratio of the frequency of oscillations of the two is 7 : 8, then the ratio of lengths of the two pendulums will be

(a) 7 : 8 (b) 8 : 7

(c) 49 : 64 (d) 64 : 49

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

(a) T_2 is infinity (b) $T_2 > T_1$

(c) $T_2 < T_1$ (d) $T_2 = T_1$

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

(a) 3*T* (b) 3/2*T*

(c) 4*T* (d) 2*T*

49. A simple pendulum is taken from the equator to the pole. Its period

(a) Decreases

(b) Increases

(c) Remains the same

(d) Decreases and then increases

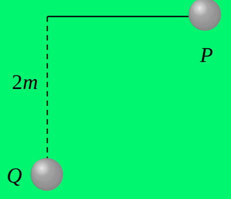
50. A pendulum of length $2m$ lift at P. When it reaches Q, it losses 10% of its total energy due to air resistance. The velocity at Q is

(a) 6 *m/sec*

(b) 1 *m/sec*

(c) 2 *m/sec*

(d) 8 *m/sec*



51. There is a simple pendulum hanging from the ceiling of a lift. When the lift is stand still, the time period of the pendulum is T. If the resultant acceleration becomes $g/4$, then the new time period of the pendulum is

(a) 0.8 T (b) 0.25 T

(c) 2 T (d) 4 T

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

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

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

53. Time period of a simple pendulum will be double, if we

(a) Decrease the length 2 times

(b) Decrease the length 4 times

(c) Increase the length 2 times

(d) Increase the length 4 times

54. Length of a simple pendulum is l and its maximum angular displacement is θ, then its maximum K.E. is

(a) $mgl\sin\theta$ (b) $mgl(1+\sin\theta)$

(c) $mgl(1+\cos\theta)$ (d) $mgl(1-\cos\theta)$

55. The velocity of simple pendulum is maximum at

(a) Extremes (b) Half displacement

(c) Mean position (d) every where

56. A simple pendulum is vibrating in an evacuated chamber, it will oscillate with

(a) Increasing amplitude (b) Constant amplitude

(c) Decreasing amplitude (d) First (c) then (a)

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

(a) $2\pi\sqrt{\frac{3L}{g}}$ (b) $\pi\sqrt{\left(\frac{3L}{g}\right)}$

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

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

(a) $T = 2\pi\sqrt{\frac{R_e}{g}}$ (b) $T = 2\pi\sqrt{\frac{2R_e}{g}}$

(c) $T = 2\pi\sqrt{\frac{R_e}{2g}}$ (d) $T = 2$ seconds

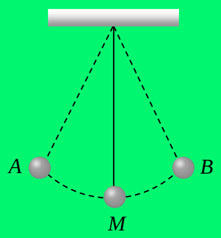
59. What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to vertical height of $10 cm$ ($g = 9.8$ m/s^2)

(a) 2.2 m/s

(b) 1.8 m/s

(c) 1.4 m/s

(d) 0.6 m/s



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

(a) Less than T (b) Greater than T

(c) Equal to T (d) Infinite

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

(a) Increases

(b) Decreases

(c) First increases then decrease

(d) None of these

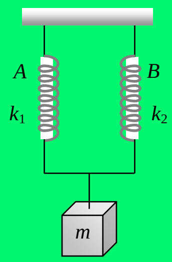
Spring Mass system

1. Two bodies M and N 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 M to that of N is

(a) $\frac{k_1}{k_2}$ (b) $\sqrt{\frac{k_1}{k_2}}$

(c) $\frac{k_2}{k_1}$ (d) $\sqrt{\frac{k_2}{k_1}}$

2. A mass m is suspended by means of two coiled spring which have the same length in unstretched condition as in figure. Their force constant are k_1 and k_2 respectively. When set into vertical vibrations, the period will be



(a) $2\pi\sqrt{\left(\frac{m}{k_1k_2}\right)}$ (b) $2\pi\sqrt{m\left(\frac{k_1}{k_2}\right)}$

(c) $2\pi\sqrt{\left(\frac{m}{k_1-k_2}\right)}$ (d) $2\pi\sqrt{\left(\frac{m}{k_1+k_2}\right)}$

3. A spring has a certain mass suspended from it and its period for vertical oscillation is *T*. The spring is now cut into two equal halves and the same mass is suspended from one of the halves. The period of vertical oscillation is now

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

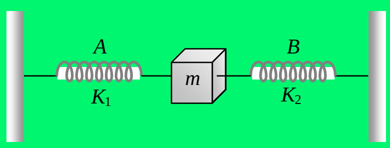
(c) $\sqrt{2}T$ (d) $2T$

4. Two masses m_1 and m_2 are suspended together by a massless spring of constant *k*. When the masses are in equilibrium, m_1 is removed without disturbing the system. Then the angular frequency of oscillation of m_2 is

(a) $\sqrt{\frac{k}{m_1}}$ (b) $\sqrt{\frac{k}{m_2}}$

(c) $\sqrt{\frac{k}{m_1+m_2}}$ (d) $\sqrt{\frac{k}{m_1 m_2}}$

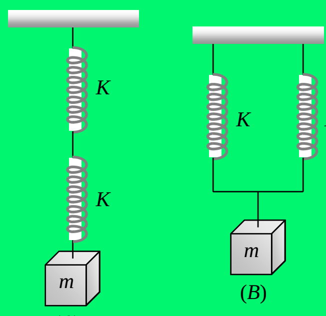
5. In arrangement given in figure, if the block of mass *m* is displaced, the frequency is given by



(a) $n = \frac{1}{2\pi}\sqrt{\left(\frac{k_1-k_2}{m}\right)}$ (b) $n = \frac{1}{2\pi}\sqrt{\left(\frac{k_1+k_2}{m}\right)}$

(c) $n = \frac{1}{2\pi}\sqrt{\left(\frac{m}{k_1+k_2}\right)}$ (d) $n = \frac{1}{2\pi}\sqrt{\left(\frac{m}{k_1-k_2}\right)}$

6. Two identical spring of constant *K* are connected in series and parallel as shown in figure. A mass *m* is suspended from them. The ratio of their frequencies of vertical oscillations will be



(A) (B)

(a) 2 : 1 (b) 1 : 1

(c) 1 : 2 (d) 4 : 1

7. A mass *m* is suspended from the two coupled springs connected in series. The force constant for springs are K_1 and K_2. The time period of the suspended mass will be

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

(c) $T = 2\pi\sqrt{\left(\frac{m(K_1+K_2)}{K_1K_2}\right)}$ (d) $T = 2\pi\sqrt{\left(\frac{mK_1K_2}{K_1+K_2}\right)}$

8. A spring is stretched by 0.20 *m*, when a mass of 0.50 *kg* is suspended. When a mass of 0.25 *kg* is suspended, then its period of oscillation will be $(g = 10 m/s^2)$

(a) 0.328 *sec* (b) 0.628 *sec*

(c) 0.137 *sec* (d) 1.00 *sec*

9. A mass M is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes simple harmonic oscillations with a time period T. If the mass is increased by m then the time period becomes $\left(\frac{5}{4}T\right)$. The ratio of $\frac{m}{M}$ is

(a) 9/16 (b) 25/16
(c) 4/5 (d) 5/4

10. A spring having a spring constant 'K' is loaded with a mass 'm'. The spring is cut into two equal parts and one of these is loaded again with the same mass. The new spring constant is

(a) $K/2$ (b) K
(c) $2K$ (d) K^2

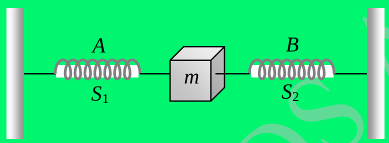
11. A weightless spring which has a force constant oscillates with frequency n when a mass m is suspended from it. The spring is cut into two equal halves and a mass $2m$ is suspended from it. The frequency of oscillation will now become

(a) n (b) $2n$
(c) $n/\sqrt{2}$ (d) $n(2)^{1/2}$

12. A mass M is suspended from a light spring. An additional mass m added displaces the spring further by a distance x. Now the combined mass will oscillate on the spring with period

(a) $T = 2\pi\sqrt{(mg/x(M+m))}$
(b) $T = 2\pi\sqrt{((M+m)x/mg)}$
(c) $T = (\pi/2)\sqrt{(mg/x(M+m))}$
(d) $T = 2\pi\sqrt{((M+m)/mgx)}$

13. In the figure, S_1 and S_2 are identical springs. The oscillation frequency of the mass m is f. If one spring is removed, the frequency will become



(a) f (b) $f \times 2$
(c) $f \times \sqrt{2}$ (d) $f/\sqrt{2}$

14. The vertical extension in a light spring by a weight of 1 kg suspended from the wire is 9.8 cm. The period of oscillation

(a) 20π sec (b) 2π sec
(c) $2\pi/10$ sec (d) 200π sec

15. A particle of mass 200 gm executes S.H.M. The restoring force is provided by a spring of force constant 80 N/m. The time period of oscillations is

(a) 0.31 *sec* (b) 0.15 *sec*
(c) 0.05 *sec* (d) 0.02 *sec*

16. 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) $2x$ (b) x
(c) $\frac{x}{2}$ (d) $\frac{x}{4}$

17. A block is placed on a frictionless horizontal table. The mass of the block is m and springs are attached on either side with force constants K_1 and K_2. If the block is displaced a little and left to oscillate, then the angular frequency of oscillation will be

(a) $\left(\dfrac{K_1+K_2}{m}\right)^{1/2}$ (b) $\left[\dfrac{K_1K_2}{m(K_1+K_2)}\right]^{1/2}$

(c) $\left[\dfrac{K_1K_2}{(K_1-K_2)m}\right]^{1/2}$ (d) $\left[\dfrac{K_1^2+K_2^2}{(K_1+K_2)m}\right]^{1/2}$

18. A uniform spring of force constant k is cut into two pieces, the lengths of which are in the ratio 1 : 2. The ratio of the force constants of the shorter and the longer pieces is

(a) 1 : 3 (b) 1 : 2

(c) 2 : 3 (d) 2 : 1

19. A mass m =100 *gms* is attached at the end of a light spring which oscillates on a frictionless horizontal table with an amplitude equal to 0.16 *metre* and time period equal to 2 *sec*. Initially the mass is released from rest at $t = 0$ and displacement $x = -0.16$ *metre*. The expression for the displacement of the mass at any time t is

(a) $x = 0.16\cos(\pi t)$ (b) $x = -0.16\cos(\pi t)$

(c) $x = 0.16\sin(\pi t+\pi)$ (d) $x = -0.16\sin(\pi t+\pi)$

20. A block of mass m, attached to a spring 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) $x = \sqrt{m/k}$ (b) $x = \dfrac{1}{v}\sqrt{m/k}$

(c) $x = v\sqrt{m/k}$ (d) $x = \sqrt{mv/k}$

21. The force constants of two springs are K_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) $K_1 : K_2$ (b) $K_2 : K_1$

(c) $\sqrt{K_1} : \sqrt{K_2}$ (d) $K_1^2 : K_2^2$

22. A mass m is vertically suspended from a spring of negligible mass; the system oscillates with a frequency n. What will be the frequency of the system if a mass 4 m is suspended from the same spring

(a) $n/4$ (b) $4n$

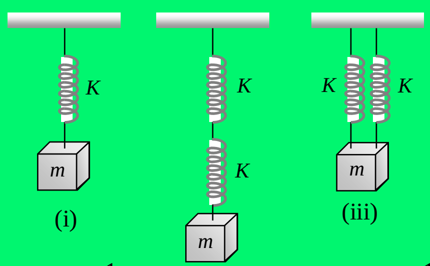
(c) $n/2$ (d) $2n$

23. If the period of oscillation of mass m suspended from a spring is 2 *sec*, then the period of mass 4m will be

(a) 1 *sec* (b) 2 *sec*

(c) 3 *sec* (d) 4 *sec*

24. 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



(i) (ii) (iii)

(a) $1 : \sqrt{2} : \dfrac{1}{\sqrt{2}}$ (b) $2 : \sqrt{2} : \dfrac{1}{\sqrt{2}}$

(c) $\dfrac{1}{\sqrt{2}} : 2 : 1$ (d) $2 : \dfrac{1}{\sqrt{2}} : 1$

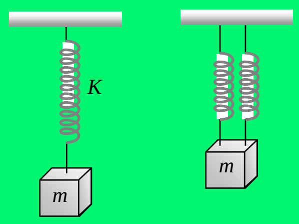
25. A mass m performs oscillations of period T when hanged by spring of force constant K. If spring is cut in two parts and arranged in parallel and same mass is oscillated by them, then the new time period will be

(a) $2T$

(b) T

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

(d) $\frac{T}{2}$



26. If a watch with a wound spring is taken on to the moon, it

(a) Runs faster (b) Runs slower

(c) Does not work (d) Shows no change

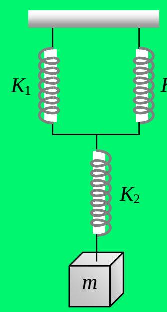
27. What will be the force constant of the spring system shown in the figure

(a) $\frac{K_1}{2} + K_2$

(b) $\left[\frac{1}{2K_1} + \frac{1}{K_2}\right]^{-1}$

(c) $\frac{1}{2K_1} + \frac{1}{K_2}$

(d) $\left[\frac{2}{K_1} + \frac{1}{K_1}\right]^{-1}$

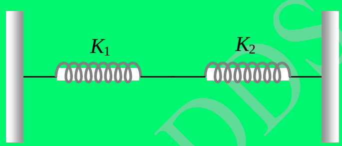


28. Two springs have spring constants K_A and K_B and $K_A > K_B$. The work required to stretch them by same extension will be

(a) More in spring A (b) More in spring B

(c) Equal in both (d) Noting can be said

29. The effective spring constant of two spring system as shown in figure will be



(a) $K_1 + K_2$ (b) $K_1 K_2 / K_1 + K_2$

(c) $K_1 - K_2$ (d) $K_1 K_2 / K_1 - K_2$

30. A mass m attached to a spring oscillates every 2 *sec*. If the mass is increased by 2 *kg*, then time-period increases by 1 *sec*. The initial mass is

(a) 1.6 *kg* (b) 3.9 *kg*

(c) 9.6 *kg* (d) 12.6 *kg*

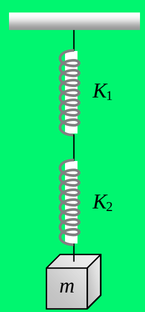
31. A mass M is suspended by two springs of force constants K_1 and K_2 respectively as shown in the diagram. The total elongation (stretch) of the two springs is

(a) $\frac{Mg}{K_1 + K_2}$

(b) $\frac{Mg\,(K_1 + K_2)}{K_1 K_2}$

(c) $\frac{Mg\, K_1 K_2}{K_1 + K_2}$

(d) $\frac{K_1 + K_2}{K_1 K_2 Mg}$



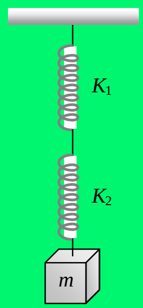
32. The frequency of oscillation of the springs shown in the figure will be

(a) $\frac{1}{2\pi}\sqrt{\frac{K}{m}}$

(b) $\frac{1}{2\pi}\sqrt{\frac{(K_1+K_2)m}{K_1K_2}}$

(c) $2\pi\sqrt{\frac{K}{m}}$

(d) $\frac{1}{2\pi}\sqrt{\frac{K_1K_2}{m(K_1+K_2)}}$



33. 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) 10 *kg* (b) 0.98 *kg*

(c) 5 *kg* (d) 20 *kg*

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

(a) $T\sqrt{n}$ (b) $T/\sqrt{n}$

(c) nT (d) T

35. One-forth length of a spring of force constant *K* is cut away. The force constant of the remaining spring will be

(a) $\frac{3}{4}K$ (b) $\frac{4}{3}K$

(c) K (d) $4K$

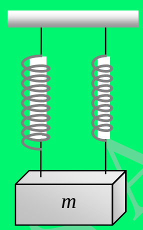
36. A mass *m* is suspended separately by two different springs of spring constant K_1 and K_2 gives the time-period t_1 and t_2 respectively. If same mass *m* is connected by both springs as shown in figure then time-period *t* is given by the relation

(a) $t = t_1 + t_2$

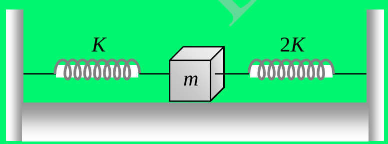
(b) $t = \frac{t_1.t_2}{t_1+t_2}$

(c) $t^2 = t_1{}^2 + t_2{}^2$

(d) $t^{-2} = t_1{}^{-2} + t_2{}^{-2}$



37. Two springs of force constants *K* and 2*K* are connected to a mass as shown below. The frequency of oscillation of the mass is



(a) $(1/2\pi)\sqrt{(K/m)}$ (b) $(1/2\pi)\sqrt{(2K/m)}$

(c) $(1/2\pi)\sqrt{(3K/m)}$ (d) $(1/2\pi)\sqrt{(m/K)}$

38. Two springs of constant k_1 and k_2 are joined in series. The effective spring constant of the combination is given by

(a) $\sqrt{k_1k_2}$ (b) $(k_1+k_2)/2$

(c) k_1+k_2 (d) $k_1k_2/(k_1+k_2)$

39. 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 period of 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) $T^{-1} = t_1^{-1} + t_2^{-1}$ (d) $T^{-2} = t_1^{-2} + t_2^{-2}$

40. Infinite springs with force constant *k*, 2*k*, 4*k* and 8*k*.... respectively are connected in series. The effective force constant of the spring will be

(a) 2*K* (b) *k*

(c) *k*/2 (d) 2048

41. To make the frequency double of a spring oscillator, we have to

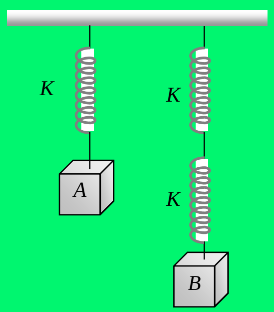
(a) Reduce the mass to one fourth

(b) Quadruple the mass

(c) Double of mass

(d) Half of the mass

42. The springs shown are identical. When $A = 4kg$, the elongation of spring is 1 *cm*. If $B = 6kg$, the elongation produced by it is



(a) 4 *cm* (b) 3 *cm*

(c) 2 *cm* (d) 1 *cm*

43. When a body of mass 1.0 *kg* is suspended from a certain light spring hanging vertically, its length increases by 5 *cm*. By suspending 2.0 *kg* block to the spring and if the block is pulled through 10 *cm* and released the maximum velocity in it in *m/s* is : (Acceleration due to gravity $= 10 m/s^2$)

(a) 0.5 (b) 1

(c) 2 (d) 4

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

(a) 2 : 1 (b) 1 : 2

(c) 4 : 1 (d) 1 : 4

45. If a spring extends by x on loading, then energy stored by the spring is (if T is the tension in the spring and K is the spring constant)

(a) $\frac{T^2}{2x}$ (b) $\frac{T^2}{2K}$

(c) $\frac{2K}{T^2}$ (d) $\frac{2T^2}{K}$

46. A weightless spring of length 60 *cm* and force constant 200 *N/m* is kept straight and unstretched on a smooth horizontal table and its ends are rigidly fixed. A mass of 0.25 *kg* is attached at the middle of the spring and is slightly displaced along the length. The time period of the oscillation of the mass is

(a) $\frac{\pi}{20} s$ (b) $\frac{\pi}{10} s$

(c) $\frac{\pi}{5} s$ (d) $\frac{\pi}{\sqrt{200}} s$

47. 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) T (b) $\frac{T}{2}$

(c) $2T$ (d) $\frac{T}{4}$

48. A mass M is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes S.H.M. of time period T. If the mass is increased by m, the time period becomes $5T/3$. Then the ratio of m/M is

(a) $\frac{5}{3}$ (b) $\frac{3}{5}$

(c) $\frac{25}{9}$ (d) $\frac{16}{9}$

49. An object is attached to the bottom of a light vertical spring and set vibrating. The maximum speed of the object is 15 *cm/sec* and the period is 628 *milli-seconds*. The amplitude of the motion in centimeters is

(a) 3.0 (b) 2.0

(c) 1.5 (d) 1.0

50. 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) $\frac{1}{7}$ *sec* (b) 1 *sec*

(c) $\frac{2\pi}{7}$ *sec* (d) $\frac{2}{3\pi}$ *sec*

51. 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) 1.22 *rad/s* (b) 2.22 *rad/s*

(c) 3.22 *rad/s* (d) 4.22 *rad/s*

52. A mass m is suspended from a spring of length l and force constant K. The frequency of vibration of the mass is f_1. The spring is cut into two equal parts and the same mass is suspended from one of the parts. The new frequency of vibration of mass is f_2. Which of the following relations between the frequencies is correct

(a) $f_1 = \sqrt{2} f_2$ (b) $f_1 = f_2$

(c) $f_1 = 2 f_2$ (d) $f_2 = \sqrt{2} f_1$

53. A mass m oscillates with simple harmonic motion with frequency $f = \frac{\omega}{2\pi}$ and amplitude A on a spring with constant K, therefore

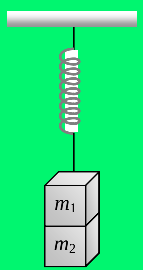
(a) The total energy of the system is $\frac{1}{2}KA^2$

(b) The frequency is $\frac{1}{2\pi}\sqrt{\frac{K}{M}}$

(c) The maximum velocity occurs, when $x = 0$

(d) All the above are correct

54. Two masses m_1 and m_2 are suspended together by a massless spring of constant K. When the masses are in equilibrium, m_1 is removed without disturbing the system. The amplitude of oscillations is



(a) $\frac{m_1 g}{K}$

(b) $\frac{m_2 g}{K}$

(c) $\frac{(m_1 + m_2)g}{K}$

(d) $\frac{(m_1 - m_2)g}{K}$

55. 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) 0.09 m (b) 0.3 m

(c) 0.03 m (d) 0.9 m

ANSWER KEY

Simple Pendulum

1	c	2	a	3	b	4	b	5	b
6	b	7	c	8	c	9	c	10	d
11	d	12	b	13	a	14	d	15	d
16	b	17	b	18	c	19	c	20	c
21	d	22	d	23	c	24	c	25	d
26	a	27	a	28	b	29	d	30	d
31	c	32	c	33	b	34	b	35	a
36	a	37	d	38	b	39	c	40	d
41	a	42	a	43	a	44	b	45	d
46	d	47	b	48	a	49	a	50	a
51	c	52	c	53	c	54	d	55	c
56	b	57	c	58	a	59	c	60	a
61	b								

Spring Mass System

1	d	2	d	3	b	4	b	5	b
6	c	7	c	8	b	9	a	10	c
11	a	12	b	13	d	14	c	15	a
16	d	17	a	18	d	19	b	20	c
21	c	22	c	23	d	24	a	25	d
26	d	27	b	28	a	29	a	30	a
31	b	32	d	33	b	34	b	35	b
36	d	37	c	38	d	39	b	40	c
41	a	42	b	43	b	44	a	45	b
46	a	47	b	48	d	49	c	50	c
51	b	52	d	53	d	54	a	55	b