RK VISION ACADEMY

PHYSICS

XI - OSCILLATION

SECTION – A

1. Which of the following equation does not represent a simple harmonic motion :

(1) y = a sinωt
(2) y = b cosωt
(3) y = a sinωt + b cotωt
(4) y = a sin2ωt

2. The equation of motion of a particle executing SHM is $\left(\frac{d^2x}{dt^2}\right) + \frac{x}{k} = 0$. The time period of the particle will be :

(1) $2\pi/\sqrt{k}$ (2) $2\pi/k$
(3) $2\pi k$ (4) $2\pi\sqrt{k}$

3. The displacement of a particle in S.H.M. is indicated by equation y = 10 sin(20πt + π/3) where y is in metres. The value of time period of vibration will be (in seconds) :

(1) 10/π (2) 1/10
(3) 2π/10 (4) 10/2π

4. The value of phase at maximum displacement from the mean position of a particle in S.H.M. is :

(1) π/2 (2) π
(3) Zero (4) 2π

5. A particle is executing S.H.M. with amplitude A and time period T. Time taken by the particle to reach from extreme position to A/ 2

(1) T/ 6 (2) T/ 12
(3) T/ 3 (4) T/ 4

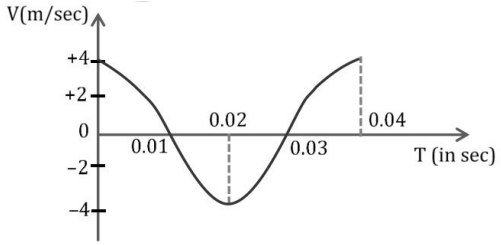
6. Two particles are executing SHM on two parallel straight lines. Amplitude 'A' and time period 'T' of both the particles are equal. At time t = 0 one particle is at displacement $x_1 = +A$ and other at $x_2 = -\frac{A}{2}$ and they are approaching towards each other. Time after which they will cross each other is

(1) T/3 (2) T/4
(3) 5T/6 (4) T/6

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

(1) 0.6 sec (2) 0.4 sec
(3) 0.3 sec (4) 0.2 sec

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



(1) 25 Hz (2) 50 Hz (3) 12.25 Hz (4) 33.3 Hz

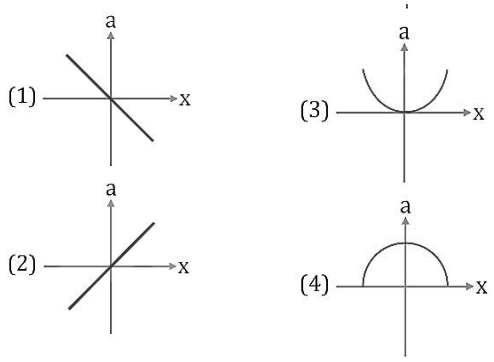
9. With help of displacement (x), velocity (v) equation $\frac{X^2}{25} + \frac{V^2}{100} = 1$For SHM, determine time period

(1) 3.14 sec (2) 1.07 sec
(3) 6.28 sec (4) 4.21 sec

10. The acceleration of a particle in SHM at 5 cm from its mean position is 80 cm/sec² . The value of angular frequency in radian/sec will be :

(1) 2 (2) 4 (3) 10 (4) 14

11. The variation of acceleration (a) and displacement (x) of the particle executing SHM is indicated by the following curve :



12. In S.H.M. which one of the following quantities has constant ratio with acceleration :-

(1) Time
(2) Displacement
(3) Velocity
(4) Mass

13. If the maximum velocity of a particle in SHM is v_0, then its velocity at half the amplitude distance from position of rest will be :

(1) $v_0/2$
(2) v_0
(3) $v_0\sqrt{3/2}$
(4) $v_0\sqrt{3}/2$

14. At a particular position the velocity of a particle in SHM with amplitude a is 1/2 of that at its mean position. In this position, its displacement is :

(1) a/2
(2) √3a/2
(3) a√2
(4) √3a

15. A body of mass 5 gm is executing S.H.M. about a point with amplitude 10 cm. Its maximum velocity is 100 cm/sec. Its velocity will be 50√2 cm/sec at what distance from mean position :

(1) 5 cm
(2) 5√2 cm
(3) 5√3 cm
(4) 10√2 cm

16. The maximum velocity and acceleration of a particle in S.H.M. are 50 cm/sec and 157 cm/sec² respectively. The time period in seconds will be :

(1) 4 (2) 1.57 (3) 0.25 (4) 2

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

(1) Value of 'a' is zero, whatever may be the value of 'v'
(2) When 'v' is zero, 'a' is zero
(3) When 'v' is maximum, 'a' is zero
(4) When 'v' is maximum, 'a' is maximum

18. The amplitude of a particle executing S.H.M. with frequency of 60 Hz is 0.01 m. Then the maximum value of the acceleration of particle is :-

(1) $144\pi^2$m/sec²
(2) 144 m/sec²
(3) $\frac{144}{\pi^2}$m/sec2
(4) $288\pi^2$ m/sec2

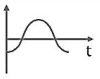
19. If the maximum velocity and maximum acceleration of a particle executing SHM are equal in magnitude, the time period will be :

(1) 1.57 second
(2) 3.14 second
(3) 6.28 second
(4) 12.56 second

20. Total work done on a simple pendulum in one complete oscillation will be :-

(1) $\frac{1}{2}$ kx²
(2) $\frac{1}{2}$ kA²
(3) kA²
(4) Zero

21. The displacement of a particle in SHM is x = a sinωt. Match the column.

(I)	(II)
(A) Graph between displacement and time	(P) 
(B) Graph between velocity and time	(Q) 
(C) Graph between acceleration and time	(R) 
	(S) 

(1) A-P, B-Q, C-R
(2) A-Q, B-P, C-S
(3) A-R, B-P, C-Q
(4) A-S, B-Q, C-T

22. The ratio of K.E. of the particle at mean position to the KE at the point where position is half of amplitude will be:

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$
(3) $\frac{4}{3}$ (4) $\frac{3}{2}$

23. The average P.E. of a body executing S.H.M. is :

(1) $\frac{1}{2}$ ka^2 (2) $\frac{1}{4}$ ka^2
(3) ka^2 (4) Zero

24. The force acting on a 4gm mass in the potential energy region $U = 2x^2$ at x = – 2cm is :

(1) 8 dyne (2) 4 dyne
(3) 16 dyne (4) 32 dyne

25. A particle is executing S.H.M., If ratio of K.E. & P.E. is equal to 3 then the ratio of displacement & amplitude will be :

(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$
(3) $\frac{1}{2}$ (4) $\frac{3}{2}$

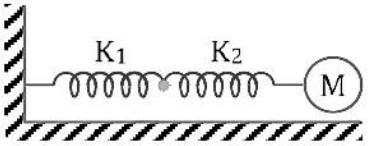
26. In an artificial satellite, the object used is :

(1) Spring watch
(2) Pendulum watch
(3) Watches of both spring and pendulum
(4) None of these

27. A mass of 10g is connected to a massless spring then time period of small oscillations is 20 second. If 10g mass is replaced by 40g mass in same spring, then its time period will be :-

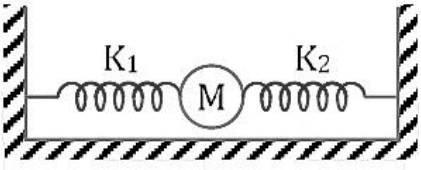
(1) 5 s
(2) 10 s
(3) 20 s
(4) 40 s

28. As shown in the figure, two light springs of force constant K_1 and K_2, oscillate a block of mass M. Then its effective force constant will be :



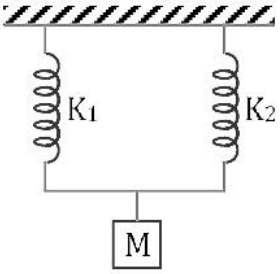
(1) $K_1 - K_2$
(2) $K_1 + K_2$
(3) $\frac{1}{K_1} + \frac{1}{K_2}$
(4) $\frac{K_1 K_2}{K_1 + K_2}$

29. In the adjoining figure the frequency of oscillation for a mass M will be proportional to :



(1) K_1K_2
(2) $K_1 + K_2$
(3) $\sqrt{K_1 + K_2}$
(4) $\sqrt{\frac{1}{K_1 + K_2}}$

30. The spring constants of two springs of same length are K_1 and K_2 as shown in figure. If an object of mass M is suspended and set into vibration, the time period will be :



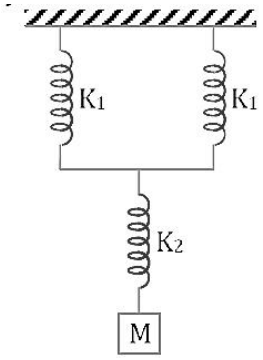
(1) $2\pi\sqrt{\frac{MK_1}{K_2}}$

(2) $2\pi\sqrt{\frac{M}{K_1K_2}}$

(3) $2\pi\sqrt{\frac{M}{K_1-K_2}}$

(4) $2\pi\sqrt{\frac{M}{(K_1+K_2)}}$

31. The total spring constant of the system as shown in the figure will be :



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

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

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

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

32. Force constant of a spring is K. If one third part is detached then force constant of remaining spring will be :

(1) $\frac{3}{2}$K

(2) $\frac{3}{4}$K

(3) K

(4) 3K

33. A loaded spring vibrate with a period T. The spring is divided into nine equal parts and the same load is suspended from one of these parts. The new period is :-

(1) T

(2) 3T

(3) T/3

(4) T/9

34. The time period of a simple pendulum on earth is T. If it is taken on the moon, and made to oscillate, the period of vibration will be :

(1) Less than T

(2) Equal to T

(3) More than T

(4) None of these

35. The mass of a bob, suspended in a simple pendulum, is halved from the initial mass, its time period will :

(1) Be less

(2) Be more

(3) Remain unchanged

(4) None of these

SECTION – B

36. The length of a simple pendulum is increased four times of its initial value, its time period with respect to its previous value will :

(1) Become twice (2) Not be different

(3) Be halved (4) Be times

37. The length of a simple pendulum is $19.6/\pi^2$ m. If g = 9.8 m/s^2, then value of time period is :

(1) 4 s

(2) $2\sqrt{2}$ s
(3) 2 s
(4) 3 s

38. A child swinging on a swing in sitting position, suddenly stands up, then the period of the swing will be:
(1) Increase
(2) Decrease
(3) Remain same
(4) Increase if child is long and decrease if child is short

39. A lift is descending with acceleration g/3. What will be the time period of a simple pendulum suspended from its ceiling, if its time period in stationary lift is T ?
(1) $\frac{T}{2}$
(2) $\sqrt{\frac{3}{2}}T$
(3) $\frac{\sqrt{3}}{4}T$
(4) $\frac{T}{4}$

40. A pendulum suspended from the ceiling of a train oscillates with a time period 2 second, when the train is accelerating horizontally at $10ms^{-2}$. What will be its time period when the train retards horizontally at $10ms^{-2}$?
(1) 2 s
(2) $2\sqrt{2}$ s
(3) $(2/\sqrt{2})$ s
(4) None of the above

41. Two sources of sound are in resonance when: -
(1) they look alike
(2) they are situated at a particular distance from each other
(3) they produce the sound of same intensity
(4) they are excited by the same exciting device

42. When a tuning fork is vibrated, another in the neighbourhood begins to vibrate. This is due to the phenomenon of :-
(1) gravitation
(2) Newton's III law
(3) Resonance
(4) None of these

43. In damped oscillation, amplitude of oscillation: -
(1) Decreases linearly
(2) Increases linearly
(3) Increases exponentially
(4) Decreases exponentially

44. When an oscillator completes 100 oscillation its amplitude reduced to $\frac{1}{3}$ of initial value. After 300 oscillations it's amplitude will be how many times of initial amplitude: -
(1) $\frac{1}{8}$
(2) 1
(3) $\frac{1}{27}$
(4) $\frac{1}{9}$

45. A mass falls from a height 'h' and its time of fall 't' is recorded in terms of time period T of a simple pendulum. On the surface of earth it is found that t = 2T. The entire set up is taken on the surface of another planet whose mass is half of that of earth and radius the same. Same experiment is repeated and corresponding times noted as t' and T', then
(1) $t' = \sqrt{2}\,T'$
(2) $t' > 2\,T'$
(3) $t' < 2\,T'$
(4) $t' = 2\,T'$

46. The distance covered by a particle undergoing SHM in one time period is (amplitude = A) :-

(1) zero (2) A (3) 2A (4) 4A

47. Average velocity of a particle executing SHM in one complete vibration is :

(1) $\frac{A\omega}{2}$

(2) $A\omega$

(3) $\frac{A\omega^2}{2}$

(4) Zero

48. The displacement of a particle executing simple harmonic motion is given by $y = A_0 + A\sin\omega t + B\cos\omega t$. Then the amplitude of its oscillation is given by :

(1) $A_0 + \sqrt{A^2 + B^2}$

(2) $\sqrt{A^2 + B^2}$

(3) $\sqrt{A_0^2 + (A + B)^2}$

(4) A + B

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

(1) 2π s (2) π s (3) 2 s (4) 1 s

50. A spring of force constant k is cut into lengths of ratio 1 : 2 : 3. They are connected in series and the new force constant is k'. Then they are connected in parallel and force constant is k″. Then k′ : k″ is:-

(1) 1 : 9

(2) 1 : 11

(3) 1 : 14

(4) 1 : 16

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