PHYSICS

BOOKS - SAI PHYSICS (TELUGU ENGLISH)

OSCILLATIONS

Mcqs

1. A particle of mass 4 kg is excuting S.H.M. Its displacement is given by the equation y=8

$\cos[100t + \pi/4]cm$. Its maximum kinetic energy is,

A. 128J

B. 64j

C. 16j

D. 32j

Answer: a

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2. The amplitude of a simple pendulum is 10cm. When the pendulum is at a displacement of 4cm from the mean position, the ratio of kinetic and potential enegies at that point is,

A. 5.25

B. 2.5

C. 4.5

D. 7.5

Answer: a

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3. The ratio between kinetic and potential enerdies of a body executing simple harmonic motion,when its is at a distance of 1/N of its amplitude from the mean potion is,

A. $N^2 + 1$

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

C. N^2

D. $N^2 - 1$

Answer: d

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4. A closed pipe is suddenly opened and changed to an open pipe osf same lenghth .The fundamental frequency of the resulting open pipe is less than that of 3^{rd} harmonic of the earlier closed pipe by 55 Hz .THEN the value of fundamental frequency of the closed pipe is,

A. 165 Hz

B. 110Hz

C. 55Hz

D. 229Hz

Answer: C

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5. Two particle A and B of mases 'm' and 2'm' are suspended from springs of force constants K_1 and K_2. During their oscillation, if their

maximum velocities are equal, then the ratio of amplitude of A and Bis,

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

B. $\sqrt{\frac{k^2}{2k_1}}$

C. $\frac{\sqrt{k}^2}{k_1}$

D. $\frac{\sqrt{k}^2}{k_1}$

Answer: b

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6. The time period of a simple harmonic motion is 8 s At t=0. it is at the mean position.The ratio of the distance travelled bi it in the first and second seconds is,

A. 1/2

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

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

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

Answer: C

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7. The length of a pendulum is measuredas 1,01 m and time for 30 oscillation is measured as one minute 3 s. Error length is 0.01 m and error in the 3 s. The percentage error in the measurement of acceleration due to gravity id,

A. 1

B. 5

C. 10

D. 15

Answer: c

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8. AIN pendulum bob is held at an angle θ from the vertical by a 2 N horizontal force F as shown supporting the pendulum bob (in N ewton) is,

A. $\cos\theta$

B. $\frac{2}{\cos\theta}$

C. $\sqrt{5}$

D. 1

Answer: c

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9. A simple harmonic oscillator consists of particle of mass m and an ideal spring with spring constant k. The particle oscillates with atime period T, The spring is cut into two

equal part. If one part oscillates with same particle,the time period will be,

A. 2T

B. $\sqrt{2T}$

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

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

Answer: C

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10. The displacement of two particle of same mass executing SHM are represented by the equations

$$x_1 = 4\sin\left(10t + \frac{\pi}{6}\right) \text{ and } x_2 = 5\cos(\omega t)$$

The value of ω for which the energies of both the particle remain same is,

A. 16 unit

B. 6 unit

C. 18 unit

D. 8 unit

Answer: d

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11. An organ pipe P_1 , closed at one end and containing a gass of density P_1 is vibrating in the harmonic. Another organ pipe P_2 is vibrating in its third harmonic. Both the pipes are in resonance with a given tuning fork. If the compressbility of gases is equal in both pipes, the ratio of the lenghth of P_1 and P_2 (assume the given gases to be monoatonic).

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

B. 3

C. $\frac{1}{6}\frac{\sqrt{P_1}}{P_2}$

D. $\frac{1}{6}\frac{\sqrt{P_2}}{P_1}$

Answer: d

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12. The displacement of a particle executing SHM is given by.

$y = 5\sin\left(4t + \frac{\pi}{3}\right)$ If T is the time period and

the mass of the particle is 2 g, the kinetic energy of the particle when $t = \frac{T}{4}$ is given by,

A. 0.4 j

B. 0.5 j

C. 3 j

D. 0.3 j

Answer: D

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13. A particle is excuting simple harmonic motion with an amplitude A and time period T. The dispolacement of the particle after 2 T period from its intial position is,

A. A

B. $4A$

C. $8A$

D. zero

Answer: d

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14. THE magnitude of maximum accesleration is π times that of maximum velocity of a simble harmonic oscillator The time period of the oscillator. The time period of the oscillator in second is,

A. 4

B. 2

C. 1

D. 0.5

Answer: b

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15. A body of mass m is suspended to an ideal spring of force constant K. The expected change in the position of the body due to an additional force F acting vertically downwards is,

A. $\frac{3F}{2K}$

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

C. $\frac{5F}{2K}$

D. $\frac{4F}{K}$

Answer:

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16. The time period of a simple pendulum is T. When the length is increased by 10 cm, its period is T_1. Then , relation between T,T_1 and T_2 is,

A. $\frac{2}{T^2} = \frac{1}{T^2} + \frac{1}{T^2}$

B. $\frac{2}{T^2} = \frac{1}{T^2} + \frac{1}{T^2}$

C. $2T^2 = T_1^2$T_2^2

D. $2T_2 = T_1^2 T_2^2$

Answer: c

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17. When a body of mass 1.0 kg is suspended from a ceryain light spring hanging vertically, its length increase by 5 cm by suspending 2.0

kg block to the spring and if the block is pulled throughn 10cm and released, the maximum velocity in it in ms^{-1} (Accesleration due to gravity = ms^{-1}.

A. 0.5

B. 1

C. 2

D. 4

Answer: b

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18. An object is attached to the bottom of a light vertical spring and set vobrating. The maximum speed of the object is $15cms^{-1}$ and the period is 628 milli-seconds The amplitude of the motion in cm is,

A. 3

B. 2

C. 1.5

D. 1

Answer: c

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19. If the displacement (x) and velocity (v) of a particle executing simple harmonic motion are related through the expression $4v^2 = 25 - x^2$, then time period is,

A. π sec

B. 2π sec

C. 4π sec

D. 6π sec

Answer:

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20. A body executes simple harmonic motion under the action of a force F_1 with a time period $\frac{4}{5}s$. If the force is changed to F_1 and F_2 it executes SHM with time period $\frac{3}{5}$ s .If the both the forces F_1 and F_2 act

simultaneously in the same direction on the body, its time period in seconds is,

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

B. $\frac{24}{25}$

C. $\frac{35}{24}$

D. $\frac{25}{12}$

Answer: a

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21. Two particles P and Q start from origin and execute simple harmonic motion along X-axis with the same amplitude but with period 3 s and 6 s respectivel,y . The ratio of the velocities of P and Q when they meet is,

A. $1:2$

B. $2:1$

C. $2:3$

D. $3:2$

Answer: b

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22. 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 a discplcement (x+y) is,

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

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

C. $E = E_1 + E_2$

D. $E = E_1 - E_2$

Answer: b

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23. A body of mass 1 kg is executing harmonic motion . Its displacement y cm at t sec is given by $y = 6\sin\left(100t + \frac{\pi}{4}\right)$ its maximum kinetic energy is,

A. 6 j

B. 18 j

C. 24 j

D. 36 j

Answer: b

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24. A particle executing simple harmonic motion has an amplitude of 6 cm. Its accesslleration at a distance from the mean

position 2 cm is $8cms^{-1}$. The maximum speed of the particle is,

A. $8cms^{-1}$

B. $12cms^{-1}$

C. $16cms^{-1}$

D. $24cms^{-1}$

Answer: b

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25. The maximum velocity of a particle executing SHM is V, If the amplitude is doubled and the time period of oscillation de4creased to $\frac{1}{3}$ of its original value, the bmaximum velocity becomes,

A. 14 V

B. 12 V

C. 6 V

D. 3 V

Answer: c

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26. Two simple pendulum of lengths 16l and l are in phase at the mean position at a certain time.IF T is the time period of shorter pendulum. The maximum time after which they will be again in phase.

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

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

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

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

Answer: d

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27. A simple body hanging freely and at rest is vertical because in that position.

A. Kinetic energy is zero

B. Kinetic energy is minimum

C. Potential energy is zero

D. Potentential energy is minimum

Answer: c

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28. The equation of motion of a particle is given by $d\frac{p}{dt} + mo^2n = 0$, where p is the momentum and n is the position.Then ,the particle

A. Moves along a straight line

B. Moves along parabola

C. Executes simple harmonic motion

D. Falls freely under gravity

Answer: C

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29. Average energy in one time period of a single harmonic oscillator whose amplitude is A, angular velocity is ω and mass is m is,

A. $m\omega^2 A^2$

B. $2m\omega^2 A^2$

C. $m\omega^2 A^2 / 2$

D. zero

Answer: c

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30. A simple harmonic oscillator has an amplitude A. The potential energy is one-

fourth of the total energy, when the displacement is,

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

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

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

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

Answer: b

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31. The time period of a simple pendulum measured inside a ststionary lift is found to be T. IF the lift starts accelarating upwards with an acceslaration of $g/3$, the time period of the pendulum will be.

A. $\sqrt{3}T$

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

C. $T/\sqrt{3}$

D. $T/3$

Answer: b

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32. A spring of force constant K is cut into two equal parts. The force constant of each part is,

A. $k/2$

B. K

C. 2 k

D. 4 K

Answer: c

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33. The displacement of a particle executing SHM is given by $y = 10\sin(6t + \pi/3)$ in metre and time t in second.The initial displacement and the velocity of the particle are respectively.

A. $5\sqrt{3}m$ and $30ms^{-1}$

B. $15m$ and $5\sqrt{3}ms^{-1}$

C. $15\sqrt{3}m$ and $30ms^{-1}$

D. $20\sqrt{3}m$ and $30ms^{-1}$

Answer: a

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34. The total mechanical energy of a harmonic oscillator of A =1 m and force constant $200 Nm^{-1} is 150 j$. Then

A. The minimum PE is zero

B. The minimum PE is 100 j

C. The minimum PE is 50 j

D. The minimum PE is 150 j

Answer: d

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35. A simple harmonic oscillation is represented by the equation $y = 0.40 \sin\left(40\frac{t}{7} + 0.61\right)$ where y and t are in metre and second respectively. The value of time period is,

A. $7\frac{\pi}{20}\text{sec}$

B. $5\frac{\pi}{20}\text{sec}$

C. $4\frac{\pi}{15}\sec$

D. $2\pi\sec$

Answer: a

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