doubtnut
India's Number 1 Education App

PHYSICS

RESONANCE ENGLISH

SIMPLE HARMONIC MOTION

Exercise

1. Equation of two S.H.M. $x_1 = 5\sin(2\pi t + \pi/4), x_2 = 5\sqrt{2}(\sin 2\pi t + \cos 2\pi t)$ ratio of amplitude & phase difference will be

A. $2:1, 0$

B. $1:2, 0$

C. $1:2, \pi/2$

D. $2:1, \pi/2$

A. $2:1, 0$

B. $1:2, 0$

C. $1:2, \pi/2$

D. $2:1, \pi/2$

Answer: B

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2. A particle is executing S.H.M. from mean position at 5 cm distance, acceleration is $20cm/\sec^2$ then value of angular velocity will be

A. 2 rad/sec

B. 4 rad/sec

C. 10 rad/sec

D. 15 rad/sec

Answer: A

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

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

C. $2\pi\alpha\beta$

D. $\frac{\pi\beta}{\alpha}$

Answer: A

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4. A particle oscillating in simple harmonic motion has amplitude 'a'. The distance from the mean position at which its velocity will be one half of the maximum velocity is

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

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

C. $a/2$

D. a

Answer: A

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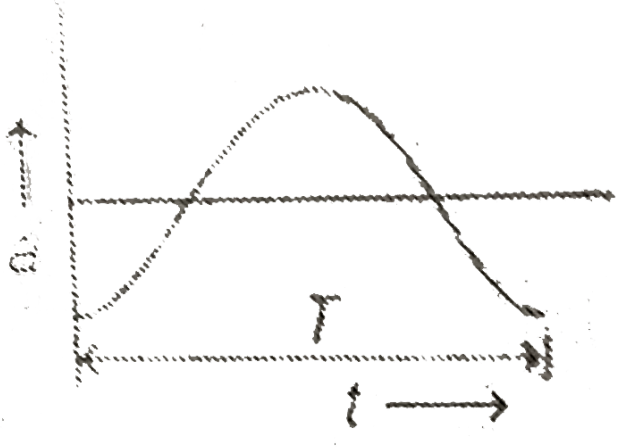
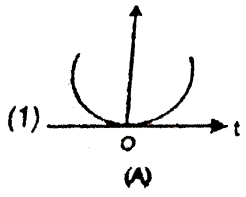
5. Acceleration versus time graph of a body in SHM is given by a curve shown below. T is the time period. Then corresponding graph between kinetic energy KE and time t is correctly represented by



A.



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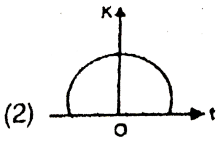

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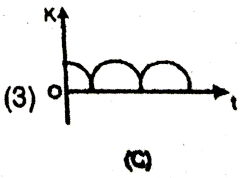
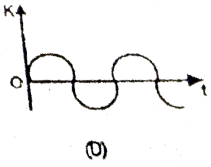


D.



Answer: C

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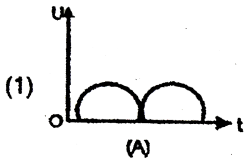
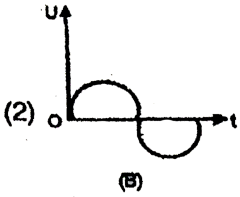
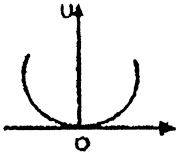
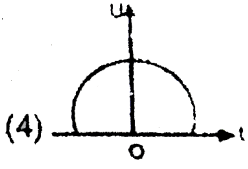
6. In S.H.M., potential energy (U) V/s, time (t) . Graph is

A. 

B. 

C. 

D. 

Answer: A

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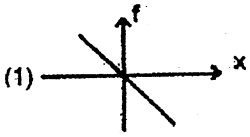
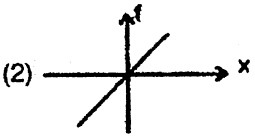
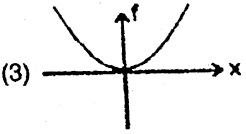
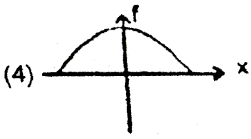
7. The variation of the acceleration (f) of the particle executing S.H.M. with its displacement (X) is represented by the curve

A. 

B. 

C. 

D. 

Answer: A

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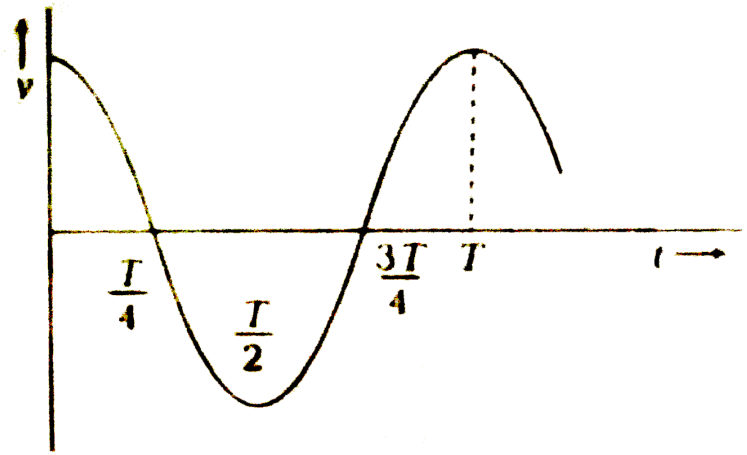
8. The displecement-time graph of a particle execting SHM is shown in figure. Which of the following statements is false?



A. the force is zero at time $\frac{3T}{4}$

B. the velocity is maximum at time T/2

C. the acceleration is maximum at time T

D. the P.E. = total energy at the time T/2

Answer: B

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9. For a simple harmonic vibrator frequency n, the frequency of kinetic energy changing completely to potential energy is

A. n/2

B. n

C. 2n

D. 4n

Answer: C

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10. A particle is executing SHM with an amplitude 4 cm. the displacment at which its energy is half kinetic and half potential is

A. 1 cm

B. $2^{1/2}cm$

C. $2cm$

D. $2(2)^{1/2}cm$

Answer: D

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11. For a particle executing S.H.M. which of the following statements holds good :

A. the total energy of the particle always remains the same

B. the restoring force is always directed towards a fixed point

C. the restoring force is maximum at the extreme positions

D. the velocity of the particle is minimum at the centre of motion of the particle

Answer: D

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12. The equation of SHM of a particle is $\frac{d^2y}{dt^2} + ky = 0$, where k is a positive constant. The time period of motion is

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

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

C. $2\pi k$

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

Answer: A

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13. The total energy of the body executing S.H.M. is E. Then the kinetic energy when the displacement is half of the amplitude is

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

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

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

D. $\frac{\sqrt{3}}{4}E$

Answer: C

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

A. Maximum potential energy is 100 J

B. Maximum K.E. is 100 J

C. Maximum P.E. is 40 J

D. Minimum P.E. is zero

Answer: B

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15. A particle executing SHM of amplitude 4 cm and T=4 s . The time taken by it to move from positive extreme position to half the amplitude is

A. 1 s

B. 1/3 s

C. 2/3s

D. $\sqrt{3/2s}$

Answer: C

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16. The potential energy of a particle execuring S.H.M. is 5 J, when its displacement is half of amplitude. The total energy of the particle be

A. 18 J

B. 10 J

C. 12J

D. 2.5J

Answer: B

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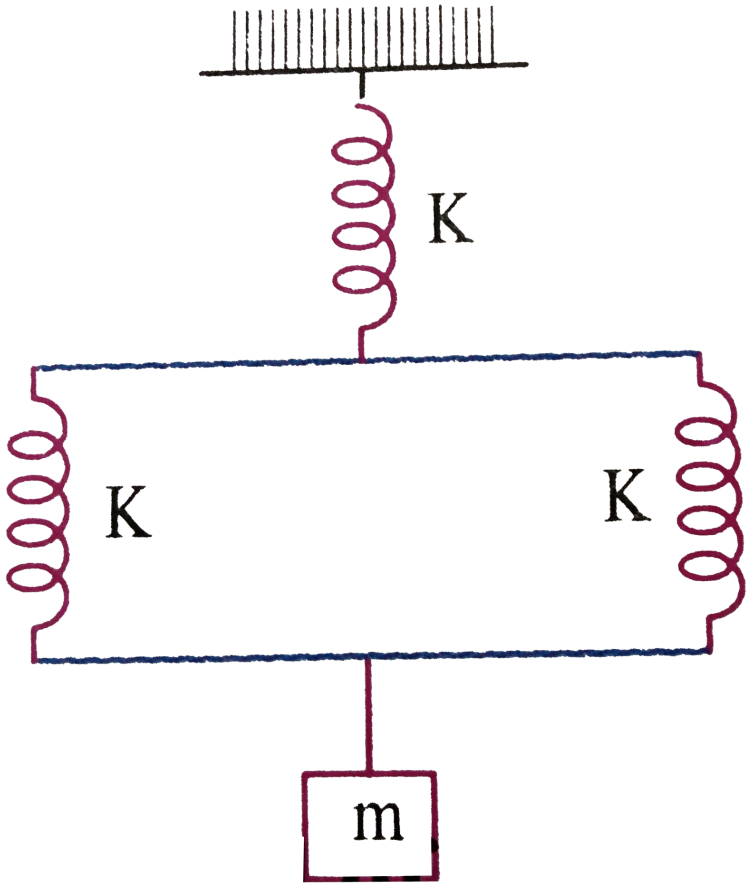
17. A body of mass m is suspended from three springs as shown in figure. If mass m is displaced slightly then time period of oscillation is



A. $2\pi\sqrt{\frac{m}{3k}}$

B. $2\pi\sqrt{\frac{3m}{2k}}$

C. $2\pi\sqrt{\frac{2m}{3k}}$

D. $2\pi\sqrt{\frac{3k}{m}}$

Answer: B

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18. One mass m is suspended from a spring. Time period of oscilation is T. now if spring is divided into n pieces & these are joined in parallel order then time period of oscillation if same mass is suspended.

A. $2\pi\sqrt{\frac{n^2m}{k}}$

B. $2\pi\sqrt{\frac{n^2k}{m}}$

C. $2\pi\sqrt{\frac{m}{n^2k}}$

D. $2\pi\sqrt{\frac{k}{n^2m}}$

Answer: C

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19. A spring has a certain mass suspended from it and its period for vertical oscillations is T_1. The spring is now cut into two equal halves and the same mass is suspended from one of the half. The

period of vertical oscillation is now T_2. The ratio of T_2 / T_1 is

A. $1/2$

B. $1/\sqrt{2}$

C. $\sqrt{2}$

D. 2

Answer: B

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20. Two objects A and B of equal mass are suspended from two springs constants k_A and k_B if the objects oscillate vertically in such a manner that their maximum kinetic energies are equal, then the ratio of their amplitudes is

A. $\frac{K_B}{K_A}$

B. $\sqrt{\frac{K_B}{K_A}}$

C. $\frac{K_A}{K_B}$

D. $\sqrt{\frac{K_A}{K_B}}$

Answer: B

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21. If the period of oscillation of mass M suspended from a spring is one second, then the period of 9M will be

A. 1/2 s

B. 1/4 s

C. 2 s

D. 4s

Answer: C

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22. A simple pendulum suspended from the ceilling of a stationary trolley has a length l. its period of oscillation is $2\pi\sqrt{l/g}$. What will be its period of oscillation if the trolley moves forward with an acceleration f ?

A. $2\pi\sqrt{\frac{l}{f-g}}$

B. $2\pi\sqrt{\frac{l}{f+g}}$

C. $2\pi\sqrt{\frac{l}{(f^2+g^2)^{1/2}}}$

D. $2\pi\sqrt{\frac{l}{f^2-g^2}}$

A. $2\pi\sqrt{\frac{l}{f-g}}$

B. $2\pi\sqrt{\frac{l}{f+g}}$

C. $2\pi\sqrt{\frac{l}{(f^2+g^2)^{1/2}}}$

D. $2\pi\sqrt{\frac{l}{f^2-g^2}}$

Answer: C

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23. If length of simple pendulum is increased by 6% then percentage change in the time-period will be

A. 3%

B. 9%

C. 6%

D. $1/9\%$

Answer: A

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24. 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/6, then the period of the pendulum will be

A. T

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

C. $\frac{2T}{\sqrt{5}}$

D. $2T\sqrt{5}$

Answer: C

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

A. applied periodic force is small

B. quality factor is small

C. damping force is small

D. restoring force is small

Answer: C

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26. The amplitude of a damped oscillator becomes half in one minutes. The amplitude after 3 minutes will be 1/x times of the original . Determine the value of x.

A. 8

B. 2

C. 3

D. 4

Answer: A

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27. Statement-1: kinetic energy of SHM at mean position is equal to potential energy at ends for a particle moving in SHM.

Statement-2: Total energy in SHM is conserved.

A. if both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

B. If both Assertion and reason are true, but reason is not correct explanation of the Assertion.

C. if assertion is true, but the reason is false

D. If assertion if false, but the reason is true.

Answer: D

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28. Statement-1 : Frequency of kinetic energy of SHM is double that of frequency of SHM.

Statement-2. In SHM the velocity is ahead of displacement by a phase angle of $\frac{\pi}{2}$.

A. Statement-1 is true, Statement-2: is true, Statement-2 is a correct explanation for

Statement-1.

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: B