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Class: 11
Subject: Physics
Topic: Oscillations
No. of Questions:29

1. The mass and diameter of a planet are twice than that of the earth. What will be the period of oscillation of a pendulum
on this planet if it is a second pendulum on earth?

A. 2

B. $\sqrt{2}$

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

D. $2\sqrt{2}$

2. The length of a simple pendulum is increased by 44%. What is the percentage increase in its period?

a. 20%

b. 30%

c. 40%

d. 50%

3. A body executes simple harmonic motion. The potential energy (PE), kinetic energy (KE) and total energy (TE) are
measured as function of displacement x. Which of the following statements is true?

a. KE is maximum when x = 0.

b. TE is zero when x = 0.

c. KE is maximum when x is maximum.

d. PE is maximum when x = 0.

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4. A particle of mass 0.1 kg is held between two springs of spring constant 8N/m and 2N/m. If this particle is displaced
along the length of spring, what will be the time period of vibration of spring?

a. $\frac{\pi}{\sqrt[3]{5}}$ s

b. $\frac{\pi}{20}$ s

c. $\frac{\pi}{5}$ s

d. 6πs

5. A point particle of mass 0.1 Kg is executing SHM of amplitude 0.1 m. When the particle passes through the mean
position its KE is 8×10^{-3} J. What is the equation of motion of this particle if the initial phase of oscillation is 45^{o}?

a. $y = 0.1 \sin(4t + \frac{\pi}{4})$

b. $y = 2 \sin(4t + \frac{\pi}{2})$

c. $y = 0.3 \sin(2t + \frac{\pi}{3})$

d. $y = 4 \sin(2t + \frac{\pi}{4})$

6. A stretched wire of length 110 cm is divided into three segments whose frequencies are in the ratio of 1 : 2 : 3. Their lengths must be

a. 20 cm; 30 cm; 60 cm

b. 60 cm; 30 cm; 20 cm

c. 60 cm; 20 cm; 30 cm

d. 30 cm; 60 cm; 20 cm

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7. 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 SHM 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. 3/5

   B. 25/9

   C. 16/9

   D. 5/3

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

   a. increase

   b. decrease

   c. remain the same

   d. depend upon the height of the child

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

   a. decrease the length by 2 times

   b. decrease the length by 4 times

   c. increase the length by 2 times

   d. increase the length by 4 times

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10. A spring has a certain mass suspended from it and its period for vertical oscillations is T1. The spring is now cut into two equal halves and the same mass is suspended from one of the halves. The period of vertical oscillations is now T2. The ratio T2/T1 is equal to

a. $\frac{1}{\sqrt{2}}$
b. $\frac{1}{2}$
c. $\frac{2}{\sqrt{3}}$
d. $\frac{1}{\sqrt{3}}$

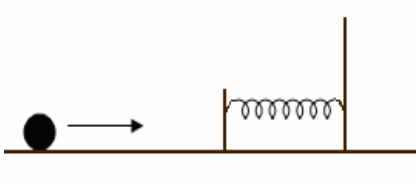
11. A linear simple harmonic oscillation has amplitude of 10 cm. What is its time period if the speed at the mean position is 31.4 cm/s?

a. 8 s
b. 6 s
c. 4 s
d. 2 s

12. A particle executes SHM of time period 8 s and amplitude 4 cm. What is the speed of the particle 2 s after it passes through the mean position?

a. 0 cm/s
b. 2 cm/s
c. 4 cm/s
d. 6 cm/s

13. A 0.5 kg mass moving with a speed of 1.5 m/s on a horizontal smooth surface collides with a nearly weightless spring of force constant k = 50 N/m. The maximum compression of the spring would be



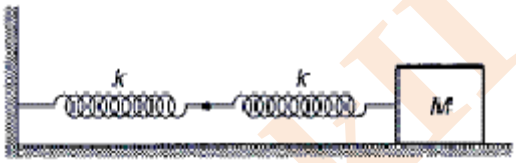
a. 0.15 m

b. 0.12 m

c. 1.5 m

d. 0.5 m

14. Two springs are connected to a block of mass M, placed on a frictionless surface, as shown in the figure below. If both the springs have a spring constant k, the frequency of the oscillation of block is



a. $\frac{1}{2\pi}\sqrt{\frac{k}{M}}$

b. $\frac{1}{2\pi}\sqrt{\frac{k}{2M}}$

c. $\frac{1}{2\pi}\sqrt{\frac{2k}{M}}$

d. $\frac{1}{2\pi}\sqrt{\frac{M}{k}}$

15. A ball of mass 2 kg moving with a velocity of 3 m/s, collides with a spring of natural

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length 2 m and force constant 144 N/m. What will be the length of the compressed spring?

a. 2 m

b. 1.5 m

c. 1 m

d. 0.5 m

16. A particle in SHM is described by the displacement equation $x(t) = A \cos(\omega t + \theta)$. If the initial (t = 0) position of the particle is 1 cm and its initial velocity is π cm/s, what is its amplitude? (The angular frequency of the particle is πs^{-1})

a. 1 cm

b. $\sqrt{2}$ cm

c. 2 cm

d. 2.5 cm

17. The angular amplitude of a simple pendulum is θ_0. What will be the maximum tension in its string?

a. $mg(1 - \theta_0)$

b. $mg(1 + \theta_0)$

c. $mg(1 - \theta_0^2)$

d. $mg\left(1 + \frac{\theta_0^2}{}\right)$

18. The time period of a particle in simple harmonic motion is 8 seconds. At t = 0 it is at the

mean position. The ratio of the distances travelled by it in the 1st second and 2nd second is

a. $\frac{1}{2}$
b. $\frac{1}{\sqrt{2}}$
c. $\frac{1}{\sqrt{2}-1}$
d. $\frac{1}{\sqrt{3}}$

19. A particle is executing two different simple harmonic motions, mutually perpendicular of different amplitudes and having phase difference of $\pi/2$. The path of the particle will be

a. circular
b. straight
c. parabolic
d. elliptical

20. A particle executes linear simple harmonic motion with amplitude of 2 cm. When the particle is at 1 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is

a. $\frac{1}{2\pi\sqrt{3}}$
b. $2\pi\sqrt{3}$
c. $\frac{2\pi}{\sqrt{3}}$
d. $\frac{\sqrt{3}}{2\pi}$

21. Which of the following condition is not sufficient for simple harmonic motion and why?

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(i) acceleration and displacement

(ii) restoring force and displacement

22. Does the direction of acceleration at various points during the oscillation of a simple pendulum remain towards mean position?

23. No, the resultant of tension in the string and weight of bob is not always towards the mean position.

What is the phase relationship between displacement, velocity and accelection in SHM?

24. How will the time period of a simple pendulum change when its length is doubled?

25. In a forced oscillation of a particle, the amplitude is maximum for a frequency ω_1 of the force, while the energy is maximum for a frequency ω_2 of the force. What is the relation between ω_1 and ω_2?

26. Time period of a particle in S.H.M depends on the force constant K and mass m of the particle$\left(\mathrm{T} = \frac{1}{2\pi}\sqrt{\frac{m}{k}}\right)$. A simple pendulum for small angular displacement independent of the mass of the pendulum of a pendulum independent of the mass of the pendulum?

27. The displacement of a particle in S.H.M may be given by y = a $\sin(\omega t + \Phi)$ show that if the time t is increased by $2\prod/\omega$, the value of y remains the same.

28. The time period of a body executing S.H.M is 1s. After how much time will its displacement be $\frac{1}{\sqrt{2}}$ of its amplitude.

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