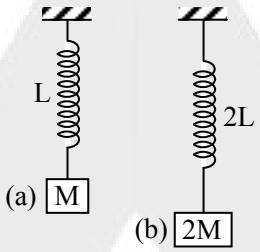
Q.1 **A mass m is suspended from a weightless spring and it has time-period ' T '. The spring is now divided into four equal parts and the same mass is suspended from one of these parts. The now time period will be -**

(A) T **(B) T/2** **(C) 2T** **(D) T/4**

Q.2 **Two springs of the same material but of length L and 2L are suspended with masses M and 2M attached at their lower ends. Their time periods when they are allowed to oscillate will be in the ratio**

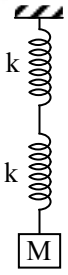


(A) 1 : 2 **(B) 2 : 1** **(C) 1 : 4** **(D) 4 : 1**

Q.3 **The length of a simple pendulum is increased by 44%. What is the percentage increase in its. time period**

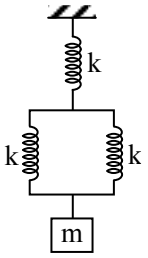
(A) 44% **(B)** $\sqrt{44\%}$ **(C) 10%** **(D) 20%**

Q.4 **The system shown in the figure, when slightly displaced and released oscillates with a period ' T '. If only one spring is used, the period of oscillation will be -**



(A) T **(B) T/2** **(C)** $\frac{T}{\sqrt{2}}$ **(D) 2T**

Q.5 **A body of mass 'm' hangs from three springs, each of spring constant 'k' as shown in the figure. If the mass is slightly displaced and let go, the system will oscillate with time period –**



(A) $2\pi\sqrt{\frac{m}{3k}}$ **(B)** $2\pi\sqrt{\frac{3m}{2k}}$

(C) $2\pi\sqrt{\frac{2m}{3k}}$ **(D)** $2\pi\sqrt{\frac{3k}{m}}$

Q.6 **A man weighing 60kg stands on the horizontal platform of a spring balance. The platform starts executing simple harmonic motion of amplitude 0.1m and frequency $2/\pi$ Hz. Which of the following statements is correct**

(A) The spring balance reads the weight of man as 60kg

(B) The spring balance reading fluctuates between 60kg and 70kg

(C) The spring balance reading fluctuates between 50kg and 60g

(D) The spring balance reading fluctuates between 50kg and 70kg

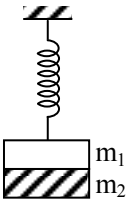
Q.7 **For an oscillating mass attached to a spring as shown in the figure, the kinetic and potential energies are equal when the displacement is about ..... % of the amplitude.**

(A) 70% **(B) 60%** **(C) 50%** **(D) 41%**

Q.8 **Two dissimilar spring fixed at one end are stretched by 10cm and 20cm respectively, when masses m_1 and m_2 are suspended at their lower ends. When displaced slightly from their mean positions and released, they will oscillate with period in the ratio**

(A) 1: 2 **(B) 2 : 1** **(C) 1:1.41** **(D) 1.41 : 4**

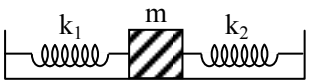
Q.9 **Two masses m_1 and m_2 are suspended together by a massless spring of constant k. When the masses are in equilibrium, m_1 is removed without disturbing the system. Then the angular frequency of oscillation of m_2 is**



(A) $\sqrt{\frac{k}{m_1}}$ **(B)** $\sqrt{\frac{k}{m_2}}$

(C) $\sqrt{\frac{k}{m_1+m_2}}$ **(D)** $\sqrt{\frac{k}{m_1-m_2}}$

Q.10 A block of mass m is connected between two springs (constants k_1 and k_2) as shown in the figure and is made to oscillate, the frequency of oscillation of the system shall be -



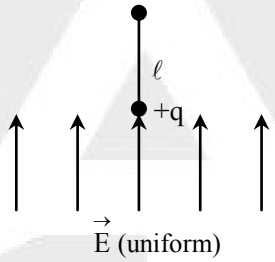
(A) $\frac{1}{2\pi}\left(\frac{m}{k_1+k_2}\right)^{1/2}$

(B) $\frac{1}{2\pi}\left(\frac{k_1k_2}{(k_1+k_2)m}\right)^{1/2}$

(C) $\frac{1}{2\pi}\left(\frac{k_1+k_2}{m}\right)^{1/2}$

(D) $\frac{1}{2\pi}\left(\frac{(k_1+k_2)m}{k_1k_2}\right)^{1/2}$

Q.11 A simple pendulum with its bob (mass m) charged with +q oscillates in a uniform electric field E, as shown in the figure the period of oscillation shall be -



(A) $2\pi\left(\frac{\ell}{g}\right)^{1/2}$ **(B)** $2\pi\left(\frac{\ell}{g+qE/m}\right)^{1/2}$

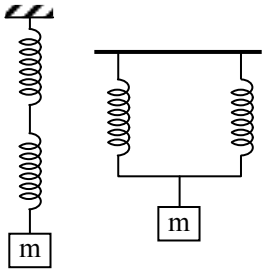
(C) $2\pi\left(\frac{\ell}{g-qE/m}\right)^{1/2}$ **(D)** $2\pi\left(\frac{\ell q}{gE/m}\right)^{1/2}$

Q.12 A particle executing S.H.M. along a straight line, when at distances X_1 and X_2 from the mean position has velocities V_1 and V_2 respectively, the period of oscillation of the particle is

(A) $2\pi\left(\frac{V_1^2-V_2^2}{X_2^2-x_1^2}\right)^{1/2}$ **(B)** $2\pi\left(\frac{X_2^2-X_1^2}{V_1^2-V_2^2}\right)^{1/2}$

(C) $2\pi\left(\frac{X_1^2+X_2^2}{V_1^2+V_2^2}\right)^{1/2}$ **(D)** $2\pi\left(\frac{X_2^2-X_1^2}{V_2^2+V_1^2}\right)^{1/2}$

Q.13 **Two identical springs of constant k are connected in series and parallel to suspend a mass m as shown in the figure. The ratio of their frequencies of oscillation shall be -**



(A) 1 : 1 **(B) 2 : 1**

(C) 1 : 2 **(D) 4 : 1**

Q.14 **A simple pendulum (whose length is less than that of a second's pendulum) and a second's pendulum starts swinging in phase. They again swing in phase after an interval of 18 second from the start. The period of the simple pendulum is**

(A) 0.9 sec **(B) 1.8 sec**

(C) 2.7 sec **(D) 3.6 sec**

Q.15 **The scale of a spring balance reading from 0 to 100kg is 20cm long. A packet suspended from the balance is found to oscillate vertically with a frequency of 5 oscillations per second. If $g = \pi^2$ (m/s^2), the mass of the packet is**

(A) 1 kg **(B) 5 kg**

(C) 10 kg **(D) 25 kg**

Q.16 **A simple pendulum of length ℓ and mass m is suspended in a car that is travelling with a constant speed v around a circle of radius R. If the pendulum undergoes small oscillations about its equilibrium position, its frequency is**

(A) $\frac{1}{2\pi}\sqrt{g/\ell}$

(B) $\frac{1}{2\pi}\sqrt{\left\{g^2+(v^2/r)\right\}/\ell}$

(C) $\frac{1}{2\pi}\sqrt{\left\{g^2+(v^2/r)^2\right\}/\ell}$

(D) $\frac{1}{2\pi}\sqrt{\left\{g^2+(v^2/r)^2\right\}^{1/2}/\ell}$

Q.17 **A simple pendulum of length ℓ has time-period T. It has a bob made of brass. Now we replace the brass bob by similar steel ball (density of still = ρ x density of brass) and at the same time change the length so as to give a period of 2T. The new length is**

(A) 2ℓ **(B) 4ℓ** **(C) $4\ell\rho$** **(D) $4\ell / \rho$.**

Q.18 **A simple pendulum has a period T. What will be the % change in its period if its amplitude is decreased by 6% -**

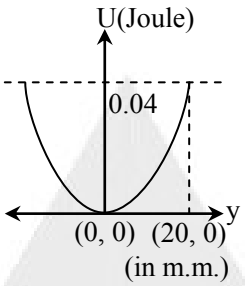
(A) 6%

(B) 3%

(C) 1.5 %

(D) it will remain unchanged

Q.19 **The variation in potential energy of a harmonic oscillator is as shown in fig. The spring constant is**



(A) 1×1.10^2 **Nm**$^{-1}$ **(B)** 2×10^2 **Nm**$^{-1}$

(C) 0.667×10^2 **Nm**$^{-1}$ **(D)** 3×10^2 **Nm**$^{-1}$

Q.20 **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 haves. The period of vertical oscillation is now T_2. the ration of T_2/T_1 is**

(A) 1/2 **(B)** $1/\sqrt{2}$ **(C)** $\sqrt{2}$ **(D) 2**

Q.21 **Two simple pendulums of lengths 1 meter and 16meteres respectively are both given small displacements in the same direction at the same instant. They will again be in phase after the shorter pendulum has completed n oscillations where n is**

(A) $\frac{1}{4}$ **(B)** $1\frac{1}{3}$ **(C) 5** **(D) 4**

Q.22 **A sphere of radius r is kept on a concave mirror of radius of curvature R. The arrangement is kept on a horizontal table. If the sphere is displaced from its equilibrium position and left, then it executes S.H.M. The period of oscillation will be-**

(A) $2\pi\sqrt{[(R-r)1.4/g]}$

(B) $2\pi\sqrt{[(R-r)/g]}$

(C) $2\pi\sqrt{[(Rr/g]}$

(D) $2\pi\sqrt{[(R/gr]}$

Q.23 **A rubber ball filled with water, having a small hole is used as the bob of a simple pendulum. The time period of such a pendulum**

(A) is a constant

(B) decreases with time

(C) increases with time

(D) first increases and then decreases finally having same value as at the beginning

Q.24 **A mass M is suspended from a spring of negligible mass. The spring is pulled is 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 (m/M) is -**

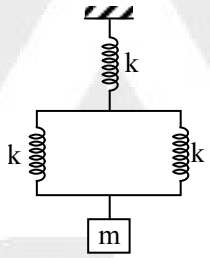
(A) 9/16 (B) 25/16 (C) 4/5 (D) 5/4

Q.25 **A small spherical steel ball is placed a little away from the centre of a large concave mirror whose radius of curvature R = 2.5cm. When the ball is released it begins to oscillate about the centre. the motion of the ball is simple harmonic then the period of motion is Neglect friction, and take g = 10m/sec^2.**

(A) 1.423 sec **(B) 2.412 sec**

(C) 0.314 sec **(D) 3.802 sec**

Q.26 **One body of mass m is suspended from three springs as shown in figure each spring has spring constant k. 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)** $2\pi\sqrt{\frac{3k}{m}}$

Q.27 **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**

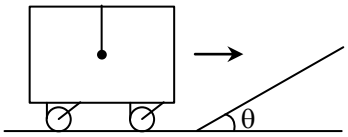
(A) $\tan^{-1}$ a/g in the forward direction

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

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

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

Q.28 **A simple pendulum has been suspended form the ceiling of a toy car moving with a uniform speed on the horizontal plane. The pendulum is oscillating with period T. Then the toy car meets the base of a smooth plane inclined at an angle θ to the horizontal and thus the toy car begins to climb the plane with its engine shut off. The period of the pendulum will now be**



(A) $T/\sqrt{\sin\theta}$ **(B)** $T\sqrt{\sin\theta}$

(C) $T/\sqrt{\cos\theta}$ **(D)** $T\sqrt{\cos\theta}$

Q.29 **A simple pendulum suspended from the ceiling of a stationary trolley has a length ℓ. Its period of oscillation is 2π. What will be its period of oscillation if the trolley moves forward with an acceleration f ?**

(A) $2\pi\sqrt{\frac{\ell}{f-g}}$ **(B)** $2\pi\sqrt{\frac{\ell}{f+g}}$

(C) $2\pi\sqrt{\frac{\ell}{(f^2+g^2)^{1/2}}}$ **(D)** $2\pi\sqrt{\frac{\ell}{f^2-g^2}}$

Q.30 **If the displacement of a particle in a SHM is half the amplitude, then its kinetic energy will be what fraction of its total energy ?**

(A) 1/4 **(B) 3/4** **(C) 1/2** **(D) 2/3**

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	B	A	D	C	B	D	A	C	B	C
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	C	B	C	B	B	D	B	D	B	B
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	B	B	D	A	C	B	B	C	C	B