



# PHYSICS

## BOOKS - VGS BRILLIANT PHYSICS (TELUGU ENGLISH)

### OSCILLATIONS

#### Very Short Answer Questions

1. Give two examples of periodic motion which are not oscillatory.



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2. The displacement in S.H.M. is given by  $y = a \sin(20t + 4)$ . What is the displacement it is increased by  $2\pi / \omega$ ?



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3. A girl is swinging seated in swing. What is the effect on the frequency of oscillation if she stands?



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4. The bob of a simple pendulum is a hollow sphere filled with water. How will the period of oscillation change. If the water begins to drain out of the hollow sphere?



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5. The bob of a simple pendulum is made of wood. What will be the effect on the time

period if the wooden bob is replaced by an identical bob of aluminium?



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6. Will a pendulum clock gain or lose time when take to the top of a mountain?



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7. What is the length of a simple pendulum which ticks seconds? ( $g = 9.8m.s^{-2}$ )



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8. What happens to the time period of a simple pendulum if its length is increased upto four times?



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9. A pendulum clock gives correct time at the equator. Will it gain or lose time if it is taken to the poles? If so, why?



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**10.** What fraction of the total energy is K.E. when the displacement is one half of a amplitude of a particle executing S.H.M?



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**11.** What happens to the energy of a simple harmonic oscillation if its amplitude is doubled?



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12. Can a simple pendulum be used in an artificial satellite? Give the reason



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## Short Answer Questions

1. Define simple harmonic motion ? Give two examples.



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2. Presents graphically the variants of displacement, velocity and acceleration with time for a particle in S.H.M.

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3. What is phase ? Discuss the phase relations between displacement, velocity and acceleration in simple harmonic motion.

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4. Obtain an equation for the frequency of oscillation of spring of force constant  $k$  to which a mass  $m$  is attached.



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5. Derivative expressions for the kinetic energy and potential energy of a simple harmonic oscillator.



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6. How does the energy of a simple pendulum vary as it moves from one extreme position to the other during its oscillations?



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7. Derive the expressions for displacement velocity and acceleration of a particle executes S.H.M.



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## Long Answer Questions

1. Define simple harmonic motion. Show that the motion of projection of particle performing uniform circular motion, on any diameter is simple harmonic.



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2. Show that the motion of a simple pendulum is simple harmonic derive an equation for its time period. What is a seconds pendulum?



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3. Derive the equation for the kinetic energy and potential energy of a simple harmonic oscillator and show that the total energy of a particle in simple harmonic motion is constant at any point on its path.



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**Problems**

1. The bob of a pendulum is made of hollow brass sphere. What happens to the time period of the pendulum, if the bob is filled with water completely? Why?



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2. Two identical springs of force constant " $k$ " are joined one at the end of the other (in series). Find the effective force constant of the combination.



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3. What are the physical quantities having maximum value at the mean position in SHM?



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4. A particle executes SHM such that, the maximum velocity during the oscillation is numerically equal to half the maximum acceleration. What is the time period?



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5. A mass of 2kg attached to a spring of force constant  $260 \text{ Nm}^{-1}$  makes 100 oscillations.

What is the time taken?



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6. A simple pendulum in a stationary lift has time period  $T$ . What would be the effect on the period when the lift (i) moves up with uniform velocity (ii) moves down with uniform velocity (iii) moves up with uniform acceleration 'a' (iv)

moves down with uniform acceleration 'a' (v) begins to fall freely under gravity?



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7. A particle executing SHM has amplitude of 4cm, and its acceleration at a distance of 1cm from the mean position is  $3cm^{-2}$ . What will its velocity be when it is at a distance of 2 cm from its mean position?



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8. A simple harmonic oscillator has a time period of 2s. What will be the change in the phase after  $0.25s$  after leaving the mean position?



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9. A body describe simple harmonic motion with an amplitude of 5 cm and a period of  $0.2s$ . Find the acceleration and velocity of the body when the displacement is (a) 5 cm (b) 3 cm (c ) 0 cm.



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**10.** The mass and radius of a planet are double that of the earth. If time period of a simple pendulum on the earth is  $T$ , find the time period on the planet.



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**11.** Calculate the change in the length of a simple pendulum of length  $1m$ , when its

period of oscillation changes from 2 s to 1.5 s.



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**12.** A freely falling body takes 2 seconds to reach the ground on a planet, when it is dropped from a height of 8m. If the period of a simple pendulum is ' $\pi$ ' seconds on the planet. Calculate the length of the pendulum.



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**13.** Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. Find the length of a simple pendulum which ticks seconds. ( $g = 9.8 \text{ms}^{-2}$ )



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**14.** The period of a simple pendulum is found to increase by 50% when the length of the pendulum is increased by 0.6m. Calculate the

initial length and the initial period of oscillation at a place where  $g = 9.8m / s^2$ .



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**15.** A clock regulated by a seconds pendulum keeps correct time. During summer the length of the pendulum increases to  $1.02m$ . How much will the clock gain or lose in one day?



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**16.** The time period of a body suspended from a spring is  $T$ . What will be the new time period, if the spring is cut into the two equal parts and (i) the mass is suspended from one part? (ii) the mass is suspended simultaneously from both the parts?



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**17.** What is the length of a simple pendulum which ticks seconds? ( $g = 9.8ms^{-2}$ )





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