PERIODIC MOTION||

CHAPTER2||

SAMPLE QUESTIONS||

SHORT QUESTIONS AND ANSWER||PERIODIC MOTION||CHAPTER2||

1. A. **Define periodic motion.**

   Ans:: **A motion which repeats after a fixed interval of time is called periodic motion.**

   B. **Define simple harmonic motion and state its equation.**

   Ans:: **The harmonic motion of the simplest type i.e of constant amplitude and of a single frequency is called simple harmonic motion.**
   Its equation is , acceleration (a)= -□²y

2. A. **Describe angular simple harmonic motion.**

   Ans:: **It is defined as the oscillatory motion of a body in which the torque or angular acceleration is directly proportional to the angular displacement and its direction opposite to that of angular displacement.**

   B. **Differentiate between SHM and ASHM.**

   Ans::

S.No.	Simple Harmonic Motion	Angular Harmonic Motion
1.	The displacement of the particle is measured in terms of linear displacement $\vec{r}$.	The displacement of the particle is measured in terms of angular displacement $\vec{\theta}$ (also known as angle of twist).
2.	Acceleration of the particle is $\vec{a} = -\omega^2 \vec{r}$	Angular acceleration of the particle is $\vec{\alpha} = -\omega^2 \vec{\theta}$
3.	Force, $\vec{F} = m\vec{a}$, where m is called mass of the particle.	Torque, $\vec{\tau} = I\vec{\alpha}$, where I is called moment of inertia of a body.

3. A. **Define simple harmonic motion with some examples.**

   Ans::**The harmonic motion of the simplest type i.e of constant amplitude and of a single frequency is called simple harmonic motion.**
   Examples: motion of simple pendulum, motion of mass spring system.

B. Compare the period of SHM and ASHM.

4. **A. Derive the expression for energy of particles executing SHM.**
    B.show that for a particle executing SHM, the maximum potential energy is the same as that of maximum kinetic energy which is equal to total energy.

5. **A. you are provided with a light spring, metre scale and known mass. How will you find the time period of oscillation of the mass attached to spring without using a clock?**
    B. Why is the mass of the string usually neglected in such a type of problem?

    Ans:: **If the mass of the string is taken into account then the effective mass of the whole system would be changed and the calculation becomes complex and on the other hand there would be an unequal distribution of tension on the string. That's why usually the mass of the string is neglected in such a problem.**

6. **A. Define mass spring system.**
    Ans:: **A spring-mass system can be described as a spring system where a mass is hung or attached at the free end of the spring.**

    B. Derive the expression for the time period for vertical oscillation of the mass spring system.

7. **A. Define a simple pendulum.**
    Ans:: **Simple pendulum is the heavy point mass suspended by an inextensible, weightless and flexible string from a rigid support which is free to oscillate in a vertical plane.**

    B. Derive the expression for the time period of a simple pendulum.

8. **A. What is the second pendulum?**
    Ans:: **A simple pendulum whose time period is two seconds is called a second pendulum.**

    B.find the length of the second pendulum on the surface of the earth.

9. **A. What is a simple pendulum?**

    Ans::**Simple pendulum is the heavy point mass suspended by an inextensible, weightless and flexible string from a rigid support which is**

free to oscillate in a vertical plane.

B. show that the motion of a simple pendulum is simple harmonic.

10. A. Define a simple pendulum.

Ans::Simple pendulum is the heavy point mass suspended by an inextensible, weightless and flexible string from a rigid support which is free to oscillate in a vertical plane.

B. Write down the drawbacks of a simple pendulum.
Ans::Drawbacks of simple pendulum are,
i)In actual practice, heavy point mass and weightless string do not exist.
ii)The motion of the bob is not strictly linear.
iii)The resistance and buoyancy of the air affect the motion of the bob.

11. A. if a simple pendulum is taken to the moon, will it gain or lose time?

12. A.Define free oscillation.
Ans:: When a body capable of oscillating if given some initial displacement from its equilibrium position and left free, it begins to oscillate with its own natural frequency with constant amplitude. Then the oscillation is called free oscillation.

B.Define damped oscillation.

Ans :: The oscillations whose amplitude goes on decreasing with time are called damped oscillations.

C.What is forced oscillation?
Ans:: When a body is maintained in a state of oscillation by an external periodic force of frequency other than the natural frequency of the body, the oscillation is called forced oscillation.

D. What is resonance?
Ans::When the natural frequency of vibration is equal to the frequency of applied force, the amplitude becomes maximum. This condition is called resonance.

NUMERICALS||PERIODIC MOTION||CHAPTER2||

1. **Displacement of an oscillating object as a function of time is shown in the figure.** Calculate i)time period ii)frequency and amplitude
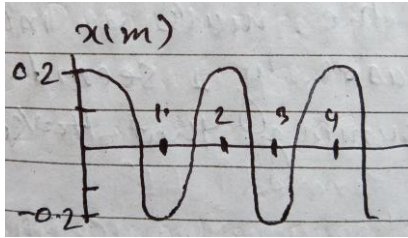
2. A particle executes SHM in a line 4 cm long. Its velocity when passed through the centre of the line is 12 cm/s. Find the period.

3. The amplitude of a particle executing SHM with a frequency of 60 Hz is 0.01 m. Determine the maximum value of the acceleration of the particle.

4. A particle executing SHM has a maximum displacement of 4 cm and the acceleration at a displacement 1 cm from its mean position is 3 cm/s². What will be its velocity when it is at a distance of 2 cm from its mean position.

5. A mass (m) attached to a spring oscillates with the period of 2 seconds. If the mass is increased by 2 kg, the period increases by 1 second. Find the initial mass (m), assume that hooke's law is obeyed.

6. Small mass of 0.2 Kg is suspended from a spring and produces an extension of 0.015m. The mass is now set into vertical oscillation of amplitude 10 mm. What is the period of the oscillation?

7. A particle which is attached to a spring oscillates horizontally with SHM with frequency of $1/\square$ Hz and total energy of 10 joules. If the maximum speed of a particle is 0.4 m/s, what is the force constant of the spring? What will be the maximum potential energy of the spring during the motion?

8. The acceleration due to gravity on the surface of the moon is 1.7 m/s². What is the period of a simple pendulum on the moon if its time period on the earth is 3.5 sec?

9. A small bob of 50 gm oscillates as a simple pendulum with an amplitude 5 cm and time period of 2 sec. Find the velocity of the bob and the tension in the supporting thread when the velocity of the bob is maximum.

10. **A simple pendulum 4 cm long swings with an amplitude of 0.2 m. Compute the velocity of the pendulum at its lowest point and its acceleration at extreme ends.**