PHYSICS

F.Sc / ICS – 1st Year

Practice Sheet Chapter 7

MCQs

1. The angle $\theta = \omega t$ which specifies the displacement as well as direction of motion of the point executing SHM is known as:

   (a) phase (b) critical angle (c) plane angle (d) solid angle

2. The time period of simple pendulum:

   (a) $T = \frac{1}{2\pi}\sqrt{\frac{l}{g}}$ (b) $T = 2\pi\sqrt{\frac{g}{l}}$ (c) $T = 2\pi\sqrt{\frac{l}{g}}$ (d) $T = 2\pi\sqrt{\frac{g}{l}}$

3. The total energy of a particle executing SHM at any displacement x is given by:

   (a) kx (b) $\frac{k}{x}$ (c) $\frac{1}{2}kx^2$ (d) $\frac{1}{2}kx_0^2$

4. The frequency of a second pendulum is:

   (a) 1 Hz (b) 0.5 Hz (c) 1.5 Hz (d) 2Hz

5. Tuning of a radio is the best example of:

   (a) mechanical resonance (b) electrical resonance
   (c) damping (d) phase modulation

6. The oscillation in which amplitude decreases steadily with the time is called:

   (a) natural oscillation (b) damped oscillation
   (c) free oscillation (d) forced oscillation

7. Distance covered during one vibration of an oscillating body in terms of amplitude A is:

   (a) A (b) 4A (c) $\frac{A}{2}$ (d) 2A

8. The SI units of spring constant are:

   (a) m^{-1} (b) Nm^{-1} (c) Nm^{-2} (d) Nm^2

9. Angular frequency is basically a characteristics of:

   (a) circular motion (b) linear motion (c) vibratory motion (d) elliptical motion

10. At mean position during SHM:
    (a) PE is maximum and KE is minimum (b) PE is minimum and KE is maximum
    (c) both are maximum (d) both KE and PE are minimum

11. The wave form of a body executing SHM is:
    (a) square wave (b) sine wave (c) circular wave pulse (d) pulse

12. In SHM the velocity of the particle is maximum at:
    (a) mean position (b) extreme position
    (c) in between mean and extreme position (d) none

13. The frequency of waves produced in microwave oven is:
    (a) 1435 MHZ (b) 2450 MHZ (c) 1860 MHZ (d) 2850 MHZ

14. Units of spring constant are similar to the units of:
    (a) force (b) momentum (c) pressure (d) surface tension

15. If mass of the suspended bob of pendulum becomes double, then its time period will be:
    (a) double (b) half (c) four time (d) remains same

16. The product of angular frequency (ω) and time period will be:
    (a) 1 (b) 2π (c) $\pi/2$ (d) π

17. A simple pendulum is oscillating in a lift. If the lift starts moving upwards with a uniform acceleration, then the time period will:
    (a) Remain unaffected (b) Be longer (c) Be shorter (d) Maybe "B" or "C"

18. A particle executing SHM has an acceleration of 65 cm s^{-2} when its displacement is 4cm, its period is second is:
    (a) $\pi/2$ (b) π (c) $\pi/4$ (d) 4π

19. At t = 0 a body performing SHM is at mean position, when t = T/4 it will be at:
    (a) At extreme position (b) Between mean and extreme position
    (c) Beyond extreme position (d) Again at mean position

20. The relation of restoring force in a simple pendulum if it makes an angle "θ" with horizontal is:

(a) mg $\sin\theta$ (b) mg $\cos\theta$ (c) mg $\tan\theta$ (d) mg $\cot\theta$

21. If the displacement in SHM is written by equation $x = x_o \cos\omega t$ the value of initial phase in this case is:

(a) $0°$ (b) $90°$ (c) $45°$ (d) $180°$

22. Spring constant of a spring and its length are related as:

(a) $k \alpha 1$ (b) $k \alpha \sqrt{1}$ (c) $k \alpha 1^{-1}$ (d) $k \alpha 1^{-1/2}$

23. When of the following can be true for "ω"?

(a) $\sqrt{\frac{k}{m}}$ (b) $\sqrt{\frac{g}{l}}$ (c) $\frac{2\pi}{T}$ (d) All of these

24. In SHM when displacement is equal to $\frac{x_o}{2}$, then the ratio of P.E to K.E is:

(a) 2:3 (b) 3:3 (c) 1:3 (d) 3:1

25. When K.E and P.E in SHM become equal to the displacement is?

(a) $\frac{x_o}{2}$ (b) $\sqrt{2x_o}$ (c) $\frac{x_o}{\sqrt{2}}$ (d) $\frac{\sqrt{3x_o}}{2}$

26. What is the phase difference between velocity and displacement in SHM:

(a) 0 (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{4}$ (d) π

27. The time period of a simple pendulum measured inside a stationary lift is T. If the lift stands moving its time period?

(a) $\frac{T}{3}$ (b) $3T$ (c) $\frac{\sqrt{3}}{2}T$ (d) $\sqrt{\frac{3}{2}}T$

28. A student made a simple pendulum of time period 1 s. The string used is length of 1 m, in order to make a simple pendulum of time period 2 s, he should use a string of length:

(a) 2 m (b) 3 m (c) 4 cm (d) 4 m

29. A girl is swinging on a swing in the sitting position. How will the time period of swing be affected if she stands up?

(a) the time period will now be shorter (b) the time period will now be longer

(c) the time period will now be unchanged (d) None of these

30. If a simple pendulum is shifted from Lahore to mount Everest, then its time period:

(a) does not change (b) decreases (c) increases (d) none of these

31. At what place motion of simple pendulum will be slowest:

(a) poles (b) equator

(c) on the surface of earth (d) at the center of earth

32. A particle executes SHM with frequency f. The frequency with which its K.E. oscillate:

(a) f (b) 2f (c) 3f (d) 4f

33. A simple harmonic oscillator has time period T. The time taken by it to travel from extreme position to half of the amplitude is:

(a) T/6 (b) T/4 (c) T/8 (d) T/2

34. Two springs have force constants in the ratio of 4:9. Their time periods are in the ratio of:

(a) 3:2 (b) 2:3 (c) 1:3 (d) 3:1

SHORT QUESTIONS

1. Show that waveform of SHM (experimentally) is sine wave.

2. Define phase.

3. Define second pendulum.

4. Calculate length of second pendulum.

5. At what displacement K.E = P.E of a vibrating mass spring system.

6. Define damped oscillations.

7. Does frequency depend on amplitude for harmonic oscillators?

8. Can we realize an ideal simple pendulum?

9. What happens to the period of simple pendulum if its length is doubled? What happens if the suspended mass is doubled?

10. Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain.

11. Describe some common phenomena in which resonance plays an important role.

12. If a mass system is hung vertically and set into oscillations, why does the motion eventually stop?

LONG QUESTIONS

Q.1

(a) Calculate instantaneous velocity of projection N of a point P moving in circle.

(b) A block of mass 4.0 kg is dropped from a height of 0.80 m on to a spring of spring constant K = 1960 Nm^{-1}. Find the maximum distance through which the spring will be compressed.

Q.2

(a) Define simple pendulum. Derive formula for its time period.

(b) A 100.0 g body is hung on a spring, which elongates the spring by 4.0 cm. when a certain object is hung on the spring and set vibrating, its period is 0.568 s. What is the mass of the object pulling the spring?

Q.3

(a) Explain energy conservation in SHM.

(b) A simple pendulum is 50.0 cm long. What will be its frequency of vibration at a place where g = 9.8 ms^{-2}.