

	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	Department: SCIENCE 2024 – 25 SUBJECT: PHYSICS	Date of: 03-02-2025
Worksheet No:13 WITH ANSWERS	CHAPTER / UNIT: OSCILLATIONS & WAVES	Note: A4 FILE FORMAT
NAME OF THE STUDENT:	CLASS & SEC:	ROLL NO.:

OBJECTIVE TYPE QUESTIONS

- How will the time period of a simple pendulum change when its length is doubled?
[a] $\sqrt{3}$ times [b] $\sqrt{2}$ times [c] 2 times [d] 4 times
- How is the time period effected, if the amplitude of a simple pendulum is increased?
[a] increases [b] decreases [c] same [d] can't be predicted
- A simple harmonic wave having amplitude A and time period T is represented by the equation $y = 5 \sin \pi(t + 4)$ metres. Then the value of A (in metres) and T (in seconds) are
(a) A = 5, T = 2 (b) A = 10, T = 1
(c) A = 5, T = 1 [d] A = 5, T = 4
- Which one of the following cannot represent a traveling wave
(a) $y = f(x - nt)$ (b) $y = y_m \sin k(x + nt)$
(c) $y = y_m \log(x - nt)$ [d] $y = y_m \log(x - +nt)$
- Which of the following statements is wrong
(a) Sound travels in a straight line
(b) Sound is a form of energy
(c) Sound travels faster in vacuum than in air
[d] none of the above
- In the longitudinal waves the direction of vibration in medium of particle is
(a) Perpendicular to propagation of wave (b) Parallel to propagation
(c) Different from each other [d] none of the above
- With the propagation of a longitudinal wave through a material medium the quantities transmitted in the propagation direction are
(a) Energy, momentum and mass (b) Energy
(c) Energy and linear momentum [d] none of the above

8. The velocity of sound is maximum in
 (a) Water (b) Air
 (c) Metal [d] none of the above
9. A simple pendulum of length l and mass (bob) m is suspended vertically. The string makes an angle q with the vertical. The restoring force acting on the pendulum, is
 (a) $mg \tan q$ (b) $mg \sin q$
 (c) $-mg \sin q$ [d] none of the above
10. A particle is vibrating in S.H.M. with an amplitude of 4 cm. At what displacement from the equilibrium position is its energy half potential and half kinetic?
 (a) $2\sqrt{2}$ cm (b) 1cm
 (c) 3 cm [d] none of the above
11. A particle executing a vibratory motion while passing through the mean position has
 (a) Maximum P.E. and minimum K.E.
 (b) Maximum K.E. and minimum P.E.
 (c) P.E. and K.E. both maximum
 [d] none of the above
12. Which of the following relationships between the acceleration 'a' and the displacement 'x' of a particle involve simple harmonic motion?
 [a] $a=0.7x$ (b) $a=-[200]^2 x$ (c) $a = -10x$ (d) $a=100x^3$

VERY SHORT ANSWER TYPE QUESTIONS[2 MARKS]

13. Why the longitudinal wave are also called pressure wave?
14. At what points is the energy entirely kinetic and potential in S.H.M?
15. What is the total distance travelled by a body executing S.H.M in a time equal to its time period, if its amplitude is A?
16. A simple pendulum consisting of an inextensible length 'l' and mass 'm' is oscillating in a stationary lift. The lift then accelerates upwards with a constant acceleration of 4.5 m/s². Write expression for the time period of simple pendulum in two cases. Does the time period increase, decrease or remain the same, when lift is accelerated upwards?
17. A girl is swinging in the sitting position. How will the period of the swing change if she stands up?

SHORT ANSWER TYPE QUESTIONS [3 MARKS]

18. Write any three characteristics of stationary waves.
19. What are transverse and longitudinal waves
20. The equation of a plane progressive wave is, $10 \sin 2\pi[t-0.005x]$ where y & x are in cm & t in second. Calculate the amplitude, frequency, wavelength & velocity of the wave.
21. Write displacement equation respecting the following condition obtained in SHM.
 Amplitude = 0.01m Frequency = 600Hz , phase = $\phi = \frac{\pi}{6}$

22. The equation of a progressive wave traveling on a stretched string is $Y = 10\sin\left[\frac{t}{0.02} - \frac{x}{100}\right]$ where x and y are in cm and t is in sec. what is the speed of the wave?

LONG ANSWER TYPE QUESTION [5 MARKS]

23. Define simple harmonic motion. Derive an expression for the displacement, velocity and acceleration of a particle executing simple harmonic motion. Draw the graph relating the [i]displacement with time[ii] velocity with time
24. Derive an expression to find the total energy of a particle executing simple harmonic motion. Represent graphically, the variations of energy with displacement .A particle executes S.H.M of amplitude 'a' . At what distance from the mean position is its K.E equal to its P.E?
25. Show that the oscillation of a simple pendulum is simple harmonic and deduce an expression for the time period of oscillation of the pendulum
26. What are standing waves. ? Show that in standing waves in a string , $v_1 : v_2 : v_3 = 1:2:3$

CASE STUDY

27. Simple harmonic motion is the simplest form of oscillation. A particular type of periodic motion in which a particle moves to and fro repeatedly about a mean position under the influence of a restoring force is termed as simple harmonic motion (S.H.M).A body is undergoing simple harmonic motion if it has an acceleration which is directed towards a fixed point, and proportional to the displacement of the body from that point.

- i. Which of the following is the characteristic of simple harmonic motion?
- (a) The motion is oscillatory and velocity is maximum at the extreme position
 - (b.) The motion is oscillatory and velocity is minimum at the extreme position
 - (c) The motion is oscillatory and the acceleration is minimum at the extreme position
 - (d) The acceleration of the particle is directed towards the extreme position
- ii. The equation of motion of a simple harmonic motion is

$$\begin{array}{ll} \text{(a)} \quad \frac{d^2x}{dt^2} = -\omega^2x & \text{(b)} \quad \frac{d^2x}{dt^2} = -\omega^2t \\ \text{(c)} \quad \frac{d^2x}{dt^2} = -\omega x & \text{(d)} \quad \frac{d^2x}{dt^2} = -\omega t \end{array}$$

iii. Which of the following motions is not simple harmonic?

- (a) Vertical oscillations of a spring
- (b) Motion of a simple pendulum
- (c) Motion of planet around the Sun
- (d) Oscillation of liquid in a U-tube

- iv. The maximum velocity of a particle, executing S.H.M with amplitude of 7mm is 4.4 m/s. What is the period of oscillation?

ANSWER KEY	
1	b
2	c
3	a
4	c
5	c
6	b
7	c
8	c
9	c
10	a
11	b
12	b
13	The longitudinal waves are called pressure waves because propagation of longitudinal waves through a medium involves changes in pressure and volume of air, when compression and rarefaction are formed.
14	At the mean position, the total energy in simple harmonic motion is purely kinetic and at the extreme position, the total energy in simple harmonic motion is purely potential energy.
15	4A
16	$T = 2\pi\sqrt{l/(g+4.5)}$ Therefore, the time period decreases when the lift accelerates upwards
17	The time period 'T' decreases
18	Ans. (i) in stationary waves, the disturbance does not advance forward. The conditions of crest and trough merely appear and disappear in fixed position to be followed by opposite condition after every half time period. (ii) The distance between two successive nodes or antinodes is equal to half the wavelength. (iii) The amplitude varies gradually from zero at the nodes to the maximum at the antinodes.
19	Refer notes
20	[i] Amplitude $A = -10\text{cm}$ [ii] frequency = 1Hz (iii) Wavelength = 200cm (iv) Velocity = 200cm/s
21	$Y = 0.01 \sin[1200\omega t + \pi/6]$
22	$Y[x,t] = A \sin [2\pi/\lambda x - 2\pi/T t + \phi] = A \sin 2\pi[x/\lambda - t/T] + \phi$ $Y[x,t] = -A \sin 2\pi[t/T - x/\lambda] + \phi$ —[b] [a] & [b] gives, $A = -10 \text{ cm}$, $\lambda = 100 \text{ cm}$, $T = 0.02\text{s}$, $f = 1/(T) = 50 \text{ hertz}$ $v = f\lambda = 50 \times 100 = 5000\text{cm/s} = 50 \text{ m/s}$
23	Refer notes
24	Refer notes
25	Refer notes

26	i.	b
	ii.	a
	iii.	c
	iv.	d

<i>Prepared by:</i> <i>Mr. William Donald Seemanthy</i>	<i>Checked by:</i> <i>HoD Science</i>
--	--