INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**Department: SCIENCE 2020 -21** **SUBJECT: PHYSICS**	**Date of submission: III week of Feb. 2021**
Worksheet No:15 **with answers**	**CHAPTER: OSCILLATIONS &WAVES**	
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS

[1]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

Answer: [b]

[2]How is the time period effected, if the amplitude of a simple pendulum is increased?

[a] increases[b] decreases [c] same

Answer: [c]

[3]A simple harmonic wave having amplitude A and time period T is represented by the equation y = 5 sin

p(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
Answer: [a]

[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) $y = y_m \log(x - nt)$
Answer: [c]

[5]Which of the following statements is wrong
(a) Sound travels in a straight line
(b) Sound is a from of energy
(c) Sound travels faster in vacuum that then in air
Answer: [c]
[6]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?
(a) 500 cm/s
(b) 50 m/s
(c) 40 m/s
Answer: [b]
[7]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
Answer: [b]
[8]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
Answer:[c]
[9]The velocity of sound is maximum in
(a) Water
(b) Air
(c) Metal
Answer: [c]
[10]The length of second's pendulum on the surface of earth is 1 m. the length of same pendulum on the surface of moon, where acceleration due to gravity is $(1/6)^{th}$ of the g on the surface of earth is
(a) 36 m (b) 1/6m (c) 1/36 m
Answer: [b]

[11] 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)

Answer: [c]

[12]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 cm (b) 1cm

(c) 3 cm

Answer: [a]

[13]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

Answer: [b]

[14]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) $a=-200x^2$ (c) $a = -10x$ (d) $a=100x^3$

Answer: [b]

VERY SHORT ANSWER TYPE QUESTIONS[2 MARKS]

[1] What is resonance?

[2] What do you mean by beats in Sound? Give any 2 applications

[3] What is the difference between Damped and undamped oscillations

[4] 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?

$V_{max} = \omega A$ or $T = 0.01s$

[5]Why the longtitudinal wave are also called pressure wave?[6]At what points is the energy entirely kinetic and potential in S.H.M? 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?

Ans. Total distance travelled in time period T = 2A + 2A = 4A.

[7]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?

When the lift is stationary, $T = 2\pi\sqrt{\frac{l}{g}}$

When the lift accelerates upwards with an acceleration of 4.5 m/s^2

$T = 2\pi\sqrt{\frac{l}{g+4.5}}$

Therefore, the time period decreases when the lift accelerates upwards

[8] A girl is swinging in the sitting position. How will the period of the swing change if she stands up?

Ans:-The girl and the swing together constitute a pendulum of time period

$T = 2\pi\sqrt{\frac{l}{g}}$

The time period 'T' decreases.

SHORT ANSWER TYPE QUESTIONS[3 MARKS]

[1]Write any three characteristics of stationary waves. 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.

[2]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.

We have $y = A\sin 2\pi[\frac{t}{T} - \frac{x}{\lambda}]$

Amplitude A = 10cm

(ii) Frequency =1Hz (iii) Wavelength= 200cm (iv) Velocity v = = 1 x 200 = 200cm/s

[3] Write displacement equation respecting the following condition obtained in SHM.

Amplitude = 0.01m Frequency = 600Hz , phase = $\varphi = \frac{\pi}{6}$

$Y = A \sin[\omega t + \varphi] = 0.01 \sin[1200\omega t + \frac{\pi}{6}]$

LONG ANSWER TYPE QUESTION [5 MARKS]

[1]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

[2]Show that for a particle in linear S.H.M., the average kinetic energy over a period of oscillation is equal to the average potential energy over the same period. At what distance from the mean position is the kinetic energy in simple harmonic oscillator equal potential energy?

[3]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?

[4]Show that the oscillation of a simple pendulum is simple harmonic and deduce an expression for the time period of oscillation of the pendulum

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