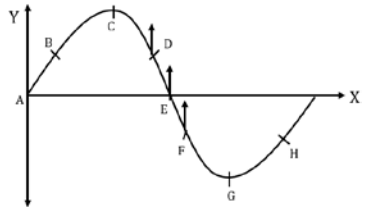
Q.1 During the propagation of wave :
(A) There is transfer of energy from one particle to another without any actual transfer of the particles of the medium.
(B) There is transfer of energy from one particle to another with transfer of the particles of the medium.
(C) There is no transfer of energy from one particle to another.
(D) None of these

Q.2 A wave equation which gives the displacement of particle along y −direction is represented as $y = 10^4 \sin(60t + 2x)$, where x and y are in metre and t in sec Among the following choose the correct statement.
(A) It represents a wave propagating along positive x-axis with a velocity of 30 m/s
(B) It represents a wave propagating along negative x- axis with a velocity of 120 m/s
(C) It represents a wave propagating along negative x- axis with a velocity of 30 m/s
(D) It represents a wave propagating along negative x- axis with a velocity of 10^4 m/s

Q.3 A transverse wave is travelling along a string from left to right. The adjoining figure represents the shape of the string at a given instant. At this instant, among the following statements, choose the incorrect one.



(A) Points D, E and F have upward (positive) velocity.
(B) Points A, B and H have downward (negative) velocity.
(C) Point C and G have zero velocity.
(D) Points A and E have minimum velocity.

Q.4 A wave equation which represents the displacement of particle along y-axis is given as: $y = 10\sin\left((30t - 2x) + \frac{\pi}{4}\right)$ where x and y are in meter and tin sec The velocity of wave is
(A)10 m/s along + vex-axis **(B)**20 m/s along -ve x-axis
(C)15 m/s along +ve x-axis **(D)**15 m/s along -pe x-axis

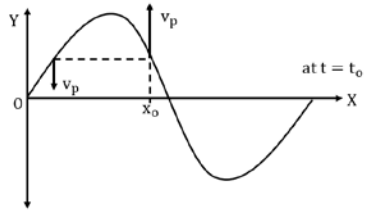
Q.5 A simple harmonic wave is represented by the relation$y(x,t) = A\sin 2x\left(vt - \frac{x}{\lambda}\right)$If the maximum particle velocity is three times the wave velocity, the wavelength λ of the wave is
(A)$\frac{\pi A}{3}$ **(B)**$\frac{2\pi A}{3}$ **(C)**πA **(D)**$\frac{\pi A}{2}$

Q.6 For a travelling wave represented by equation, $y = 0.2\sin 2\pi\left(x - 110t + \frac{1}{2}\right)$ (SI units)The phase difference between particles at $x_1 = 4.5$ m and $x_2 = 7$ m is
(A)π **(B)**3π **(C)**5π **(D)**7π

Q.7 When a sound wave of wavelength λ is propagating in a medium, the maximum velocity of the particle is equal to the wave velocity. The amplitude of wave is:
(A)λ **(B)**$\frac{\lambda}{2}$ **(C)**$\frac{\lambda}{2\pi}$ **(D)**$\frac{\lambda}{4\pi}$

Q.8 The equation of a plane progressive wave is given byy $= 0.025\sin(100t + 0.25x)$Which of the following represents the velocity of the particle of medium through which the sinusoidal wave is propagating?
(A)$2.5\cos(100t + 0.25x)$ **(B)**$50\cos(100t + 0.25x)$
(C)$5\sin(100t + 0.25x)$ **(D)**$20\sin(50t + 0.25x)$

Q.9 For given shape of wave at time $t = t_0$, velocity of particle at $x = x_0$ is twice the wave velocity of given transverse wave. Find the slope of wave atx $= x_0$.



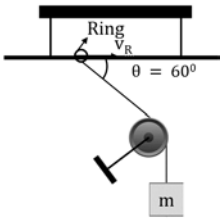
(A)2 **(B)**–2 **(C)**1 **(D)**–1

Q.10 The equation for a wave travelling in x direction on a string is given as $y = 10\sin(\pi t - 0.5x)$where y and x are in m and time(t) in sec. Find the acceleration of a particle at $x = \pi$ m at time $t = 1$ sec.

(A) -10π m/s^2 **(B)** $-10\pi^2$ m/s^2 **(C)** 5π m/s^2 **(D)** -5π m/s^2

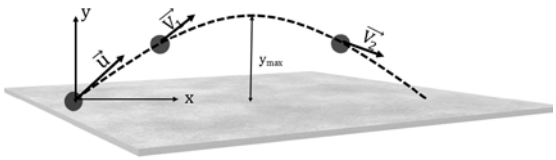
WORK SHEET

Q.1 The figure shows mass m with velocity U. Ring is restricted to move on smooth fixed horizontal rod. The velocity of ring at that moment is.



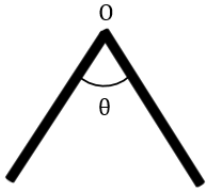
(A) U/2 **(B)** 2U **(C)** $2U/\sqrt{3}$ **(D)** $(\sqrt{3}U)/2$

Q.2 A projectile is thrown with a speed u at an angle θ with the vertical. Its average velocity between the instants, it crosses half the maximum height is :



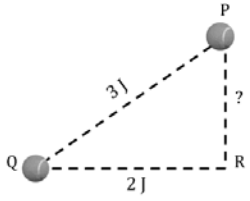
(A) ucos θ horizontal and in the plane of projection
(B) usin θ horizontal and in the plane of projection
(C) 2usin θ vertical and in the plane of projection
(D) 2ucos θ vertical and in the plane of projection

Q.3 A uniform thin rod of length L and mass M is bent at the middle point O as shown in figure. Consider an axis passing through its middle point O and perpendicular to the plane of the bent rod. Then moment of inertia about this axis is :



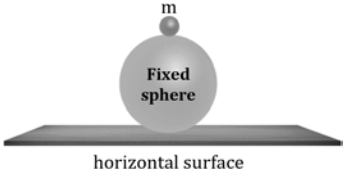
(A) $\frac{2}{3}mL^2$ **(B)** $\frac{1}{3}mL^2$ **(C)** $\frac{1}{12}mL^2$ **(D)** Dependent on θ

Q.4 For the path PQR in a conservative force field (figure), the amount of work done in carrying a body from P to Q & from Q to R are 3 J&2 J respectively. The work done in carrying the body from P to R will be.



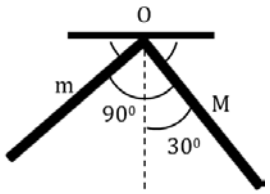
(A) 7 J **(B)** 3J **(C)** 5J **(D)** 0

Q.5 A particle of mass m begins to slide down a fixed smooth sphere from the top as shown. What is its acceleration when it breaks off the sphere?



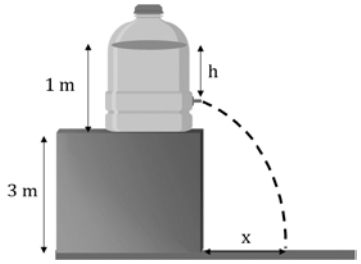
(A)$2g/3$ **(B)**$\sqrt{5}g/3$ **(C)**g **(D)**$g/3$

Q.6 Two uniform rods of equal length but of different masses are rigidly combined to form a L − shaped body, which is then pivoted about O as shown in figure. If combination is in equilibrium then ratio M/m will be



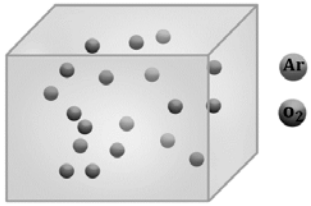
(A)0.5 m **(B)**0.8m **(C)**1m **(D)**0.2m

Q.7 A water tank stands on the roof of a building as shown in the figure. The value of height of water above the hole (h) for which the horizontal distance covered by the water (x) is maximum -



(A) 0.5 m **(B)** 0.8m **(C)** 1m **(D)** 0.2m

Q.8 A gas mixture consists of 2 moles of oxygen and 4 moles of argon at temperature T. Neglecting all vibrational modes, the total internal energy of the system is

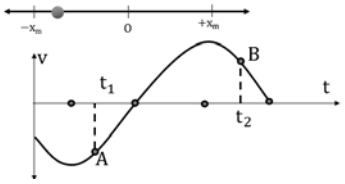


(A)14 RT **(B)**13RT **(C)**15RT **(D)**11RT

Q.9 A simple pendulum 50 cm long is suspended from the roof of a cart accelerating in the horizontal direction with constant acceleration of $\sqrt{3}g$ m/s^2. The period of small oscillations of the pendulum about its equilibrium position is- ($g = \pi^2$ m/s^2)

(A)1.0 sec **(B)**$\sqrt{2}$sec **(C)**1.53sec **(D)**1.68sec

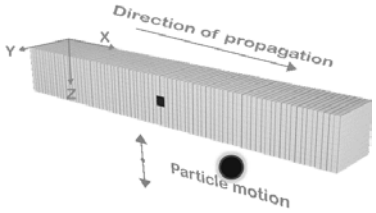
Q.10 A particle is executing SHM between points −Xm and +Xm as shown in the figure −I. The velocity v(t) of the particle is partially graphed and shown in the figure −II. Two points A and B corresponding to time t_1 and time t_2 respectively are marked on the v(t) curve



(A) At timet_1, its position lies at O
(B) At timet_2, its position lies at O
(C) At timet_1, its position lies between $-X_m$ and O
(D) At timet_2, its position lies between $-X_m$ and O

Q.11 A longitudinal wave is propagating along x − axis. Particles of the medium vibrates along

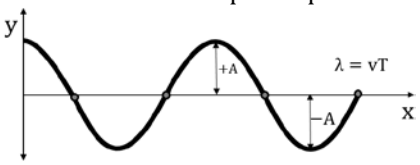
(A) x − axis **(B)** y − axis **(C)** z − axis **(D)** None of these



Q.12 Which of the following expressions represents a simple harmonic progressive wave?

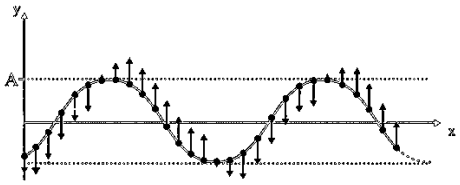
(A) $A\sin\omega t$ **(B)** $A\sin\omega t\cos kx$ **(C)** $A\sin(\omega t - kx)$ **(D)** $A\cos kx$

Q.13 Speed of sinusoidal transverse wave does not depend upon



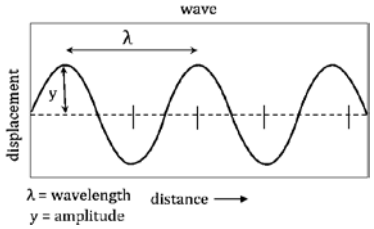
(A) Time period **(B)** frequency
(C) Initial phase constant **(D)** wavelength

Q.14 A transverse wave is passing through a medium. The maximum speed of the vibrating particle occurs when the displacement of the particle from the mean position is:



(A) Zero **(B)** Half of the amplitude
(C) Equal to the amplitude **(D)** None of these

Q.15 A wave is represented by $y = 0.1\sin(100\pi t - kx)$ where y, t, x are in SI units. If wave velocity is 100 m/s, its wave number is

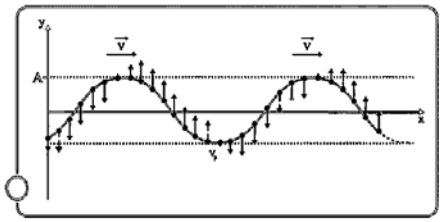


(A) 1m^{-1} **(B)** 2m^{-1} **(C)** πm^{-1} **(D)** $2\pi\text{m}^{-1}$

Q.16 The phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is 0.5 π. The wave velocity is

(A) 144 m/s **(B)** 256m/s **(C)** 348m/s **(D)** 724m/s

Q.17 The equation of a travelling wave is, $y = 60\cos(1800t - 6x)$ where y is in microns, t in sec and x in metres. The ratio of maximum particle velocity to velocity of wave propagation is



(A) 3.6 **(B)** 3.6×10^{-6} **(C)** 3.6×10^{-11} **(D)** 3.6×10^{-4}

Q.18 In a plane progressive harmonic wave the maximum particle speed is always less than the wave speed if:

(A) Amplitude of wave $< \frac{\lambda}{2\pi}$ **(B)** Amplitude of wave $> \frac{\lambda}{2\pi}$

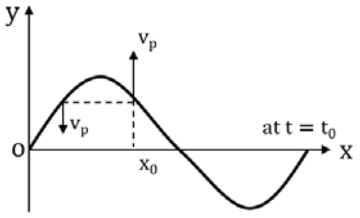
(C) Amplitude of wave $< \lambda$ **(D)** Amplitude of wave $> \frac{\lambda}{\pi}$

Q.19 The equation of a transverse wave propagating through a medium is given by $y = 10\sin(\pi t + 0.5x)$. Choose the correct statement for the velocity of particle present at $x = 0$.

(A) At $t = 0$, velocity of particle is 0 m/s **(B)** At $t = 0.5$sec, velocity of particle is π m/s

(C) At $t = 3$sec, velocity of particle is 10π m/s **(D)** At $t = 0.5$sec, velocity of particle is 0 m/s

Q.20 Shape of a transverse wave at time $t = t_0$ is shown in the figure given below. At $x = x_0$ and time $t = t_0$, slope of the wave curve is 5. Find the ratio of particle velocity to the wave velocity at $x = x_0$



(A) $-5:1$ **(B)** $1:-5$ **(C)** $5:1$ **(D)** $1:5$

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(C)	(D)	(C)	(B)	(C)	(C)	(A)	(B)	(B)
WORK SHEET										
Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(B)	(B)	(C)	(C)	(B)	(D)	(C)	(D)	(A)	(C)
Q.	11	12	13	14	15	16	17	18	19	20
Sol.	(A)	(C)	(C)	(A)	(C)	(C)	(D)	(A)	(D)	(A)