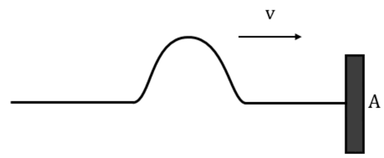
Q.1 Which of the following property of the wave can differ the incident wave and reflected wave?

(A) Wavelength **(B)**Speed **(C)**Phase **(D)**Frequency

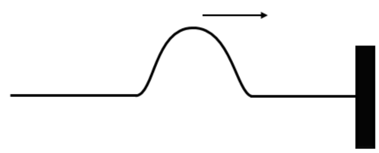
Q.2 Wave is travelling on a stretched string fixed at one end as shown in the figure. The resultant force acting on particle at point A is



(A) Zero **(B)**in upward direction

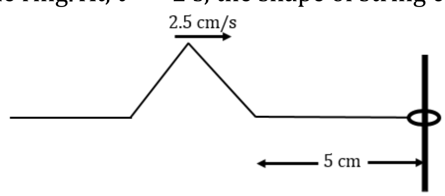
(C) In downward direction **(D)**can't be determined

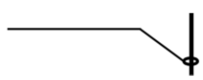
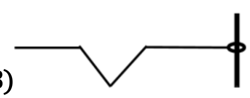
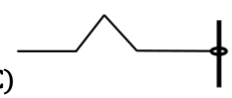
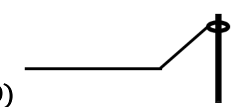
Q.3 A wave, $y = 2\sin\left(\pi t + x + \frac{\pi}{6}\right)$ is propagating on a stretched string fixed at one end. The equation of reflected wave can be given as



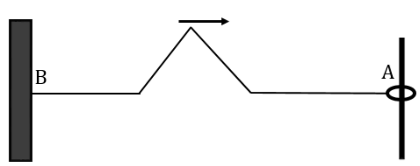
(A)$-2\sin(\pi t - x + \frac{\pi}{6})$ **(B)**$-3\sin(\pi t - x + \frac{\pi}{6})$ **(C)**$3\sin(\pi t - x + \frac{\pi}{6})$ **(D)**$2\sin(\pi t - x + \frac{\pi}{6})$

Q.4 Right end of the string is attached to a light frictionless ring which can freely move on a vertical rod. A wave pulse is sent on the string from left propagating with speed 2.5 cm/s. Initially, the centre of pulse is 5 cm apart from the ring. At, $t = 2$ s, the shape of string can be given as



(A)  **(B)**  **(C)**  **(D)** 

Q.5 A pulse (shown here) is first reflected form the free end A and then from the rigid end B. The phase difference between initial incident pulse and final reflected pulse after two reflection is.

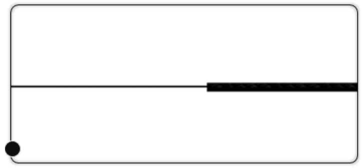


(A)π **(B)**2π **(C)**0 **(D)**3π

Q.6 Two waves, $y_1 = 2a\cos\omega t$ and $y_2 = 3a\cos(\omega t + \frac{\pi}{2})$ meet at point. The amplitude of the resultant wave is

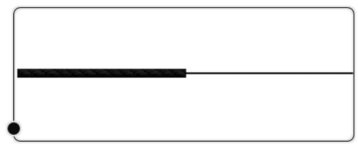
(A)a **(B)**5a **(C)**3.6 a **(D)**2.5 a

Q.7 A wave travelling on a string is transmitted to other string of different density, gets partially reflected at the junction. The reflected wave is inverted in shape as compared to the incident wave. If the incident wave has wavelength λ_1 and the transmitted wave λ_2, then



(A)$\lambda_2 > \lambda_1$ **(B)**$\lambda_2 = \lambda_1$ **(C)**$\lambda_2 < \lambda_1$ **(D)**Cannot be predicted

Q.8 Equation of a plane progressive wave is given by$y = A_1 \sin \pi\left(t - \frac{x}{3}\right)$. After reflecting from a rarer medium amplitude of reflected wave becomes A_2. The equation of the reflected wave can be



(A)$A_1 \sin \pi(t + \frac{x}{3})$ **(B)**$A_2 \sin \pi(t - \frac{k}{3} + 1)$

(C)$A_2 \cos \pi(t + \frac{x}{3})$ **(D)**$A_2 \sin \pi(t + \frac{x}{3})$

Q.9 Equation of a plane progressive wave is given by $y = 0.5 \sin 3\pi\left(t - \frac{x}{3}\right)$. on reflection from a denser medium its amplitude becomes $\frac{2}{5}$ of the amplitude of the incident wave. The equation of the reflected wave is.

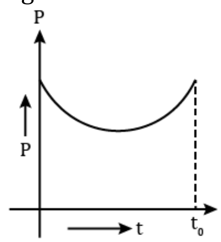
(A)$0.2\sin(\pi(3t + x))$ **(B)**$-0.2\sin(3\pi t + \pi x)$ **(C)**$0.5\sin(\pi t + x)$ **(D)**$0.2\sin(\pi(3t - x))$

Q.10 A travelling wave is partly reflected and partly transmitted from a rigid boundary. Let a_i, a_r and a_t be the amplitudes of incident wave, reflected wave and transmitted wave and I_i, I_r and I_t be the corresponding intensities. Then, choose the correct alternative.

(A)$\frac{I_i}{I_r} = (\frac{a_i}{a_r})^2$ **(B)**$\frac{I_i}{I_t} = (\frac{a_i}{a_t})^2$ **(C)**$\frac{I_r}{I_t} = (\frac{a_r}{a_t})^2$ **(D)**All of these

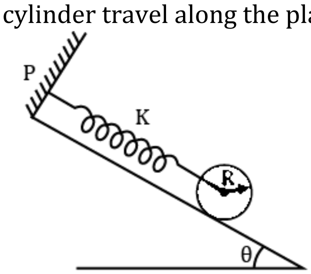
WORK SHEET

Q.1 Power versus time graph for a force is given below. Work done by the force up to time t ($\leq t_0$),



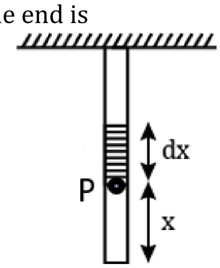
(A) First decreases the increases
(B) First increases then decreases
(C) Always increases
(D) Always decreases

Q.2 A uniform cylinder of mass m and radius R rolls without slipping down a slope of angle θ with the horizontal. The cylinder is connected to a spring having spring constant K while the other end of the spring is connected to a rigid support at P. The cylinder is released when the spring is unscratched. The maximum distance that the cylinder travel along the plane is



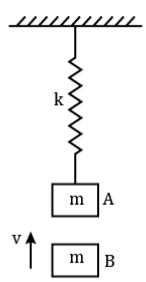
(A) $\frac{3mg\sin\theta}{4K}$
(B) $\frac{mg\sin\theta}{K}$
(C) $\frac{2mg\sin\theta}{K}$
(D) $\frac{4mg\sin\theta}{3K}$

Q.3 The extension in a uniform rod of length l, mass m, cross sectional area A and young's modulus Y when it is suspended vertically at one end is



(A) $\frac{mgl}{AY}$
(B) $\frac{mgl}{2AY}$
(C) $\frac{2mgl}{AY}$
(D) $\frac{mgl}{4AY}$

Q.4 Block A of mass m is hanging from a vertical spring having stiffness k and is at rest. Block B of identical mass strikes the block A with velocity v and sticks to it. Then the value of v from which the spring just attains natural lengths is

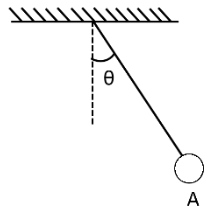


(A) $\sqrt{\frac{5mg^2}{k}}$
(B) $\sqrt{\frac{6mg^2}{k}}$
(C) $\sqrt{\frac{7mg^2}{k}}$
(D) $\sqrt{\frac{8mg^2}{k}}$

Q.5 Statement 1: Consider an object that floats in water but sinks in oil. When the object floats in water with half submerged, if oil is slowly poured into the water till it completely covers the object, the object moves up.

Statement 2: As the oil is poured in the situation of Statement 1, pressure inside the water will increaseeverywhere resulting in an increase in upward force onthe object.
(A) Statement 1 is true, Statement 2 is true; Statement 2 is correct explanation for Statement 1
(B) Statement 1 is true, Statement 2 is true; Statement 2 is not correct explanation for Statement 1
(C) Statement 1 is true, Statement 2 is false
(D) Statement 1 is false, Statement 2 is true.

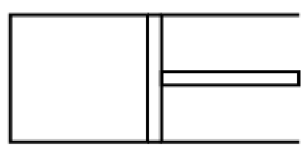
Q.6 A simple pendulum is oscillating in a vertical plane. If resultant acceleration of bob of mass m at a point A is in horizontal direction, find the tangential force at this point in terms of tension (T) and weight of pendulum (mg).



(A)$T + mg$ **(B)**$\frac{mg}{T}\sqrt{T^2 - (mg)^2}$ **(C)**$\frac{mg}{T}\sqrt{(mg)^2 + T^2}$ **(D)**$\frac{T}{mg}\sqrt{(mg)^2 + T^2}$

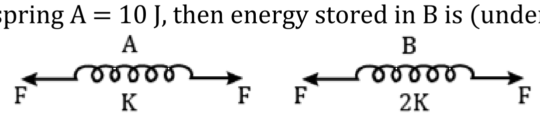
Q.7 20 gm ice at -10°C is mixed with m gm steam at 100 °C. The minimum value of m so that finally all ice and steam converts into water is
[Use, specific heat and latent heat as$C_{ice} = 0.5$ cal/gm °C, $C_{water} = 1$ cal/gm °C, $L_{melt} = 80$ cal/gm and $L_{vapour} = 50$ cal/gm]
(A)$\frac{185}{27}$ gm **(B)**$\frac{135}{17}$ gm **(C)**$\frac{85}{32}$ gm **(D)**$\frac{113}{17}$ gm

Q.8 n moles of a gas filled in a container at temperature T is in thermodynamic equilibrium initially. If the gas is compressed slowly and isothermally to half its initial volume then the work done by the atmosphere on the piston is -



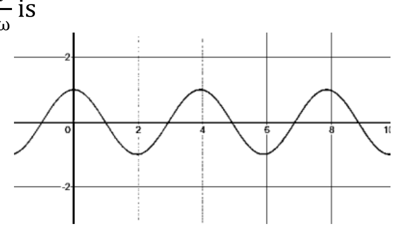
(A)$nRT\ln 2$ **(B)**b $\frac{nRT}{2}$ **(C)**$-\frac{3nRT}{2}$ **(D)**$\frac{3nRT\ln 2}{2}$

Q.9 If the energy stored in spring A = 10 J, then energy stored in B is (under same stretching force)



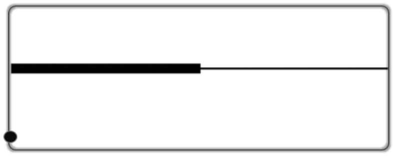
(A)10 J **(B)**5J **(C)**2.5J **(D)**1.25J

Q.10 A particle is executing SHM according to the equation, $x = A\cos\omega t$. Average speed of the particle during the interval $0 \le t \le \frac{\pi}{6\omega}$ is

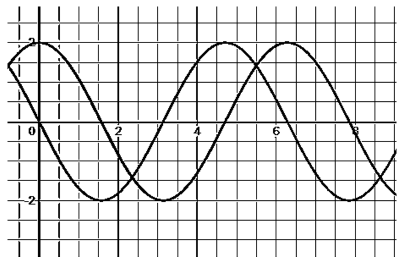


(A)$\frac{\sqrt{3}A\omega}{2}$ **(B)**$\frac{\sqrt{3}A\omega}{4}$ **(C)**$\frac{3A\omega}{\pi}$ **(D)**$\frac{3A\omega}{\pi}(2 - \sqrt{3})$

Q.11 Which quantity will always remain when an incident wave transmits from one medium to other?
(A) Wave speed **(B)**Amplitude **(C)**Wavelength **(D)**Frequency

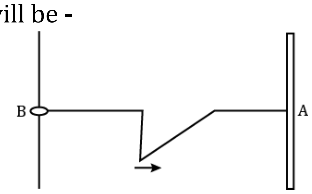


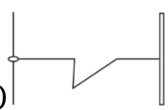
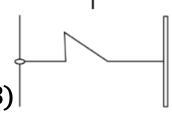
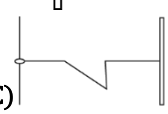
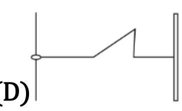
Q.12 Two interfering waves have the same wavelength, frequency and amplitude. They are travelling in the same direction but 90° out of phase compared to individual waves. The resultant wave will have the same



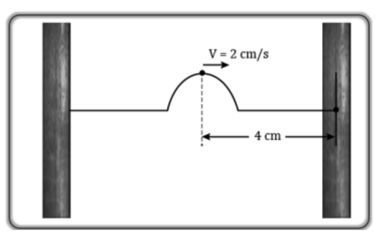
(A)Amplitude and velocitybut different wavelength
(B)Frequency and velocity butdifferent wavelength
(C)Wavelength and velocitybut different amplitude
(D)Amplitude and frequency butdifferent wavelength

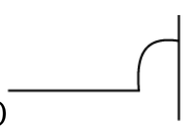
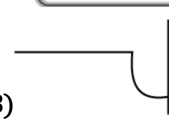
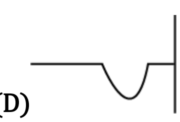
Q.13 A pulse (shown here) is reflected from the rigid wall A and then from free end B. The shape of the string after these 2 reflections will be -



(A)  (B)  (C)  (D) 

Q.14 A pulse is travelling on a stretched sting fixed at one end with velocity 2 cm/s as shown in the figure. At t = 0 s, center of pulse is 4 cm apart from the fixed end. The shape of string at t = 2 s is



(A)  (B)  (C)  (D) 

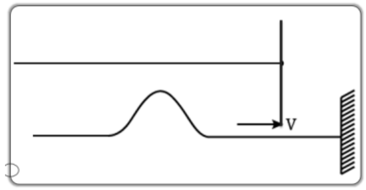
Q.15 When a wave a pulse travelling in a string is reflected from a rigid wall to which string is tied as shown in figure. For this situation two statements are given below.

1. The reflected pulse will be in same orientation of incident pulse due to a phase change of π radians
2. During reflection the wall exert a force on string upward direction.

For the above given two statements,

Choose the correct option given below.

(A) Only (1) is true **(B)**Only (2) is true **(C)**Both are true **(D)**Both are wrong



Q.16 Statement I- Two longitudinal waves given by equations$y_1(x,t) = 2a\sin(\omega t - kx)$ and $y_2(x,t) = a\sin(2\omega t - 2kx)$Will have equal intensity.

Statement II- Intensity of waves of given frequency in same medium is proportional to square of amplitude only.

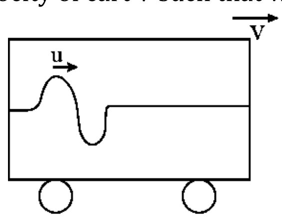
(A) Statement I is true, statement II true; Statement II is the correct explanation of statement I

(B) Statement I is true, statement II true; Statement II is not correct explanation of statement I

(C) Statement I is true, statement II false

(D) Statement I is false, statement II is true

Q.17 A transverse wave is travelling on stretched string with velocity u. Tension in the string is T and mass density of string is r. Find the velocity of cart V such that waves seem stationary w.r.t cart.



(A)$\sqrt{\frac{T}{r}}$ **(B)**$2\sqrt{\frac{T}{r}}$ **(C)**$3\sqrt{\frac{T}{r}}$ **(D)**None of these

Q.18 The equation of a plane progressive wave is $y = 0.09\sin 8\pi\left(t - \frac{x}{20}\right)$.When it is reflected at rigid support, its amplitude become $\frac{2rd}{3}$ of its previous value. Then the equation of the reflected wave is

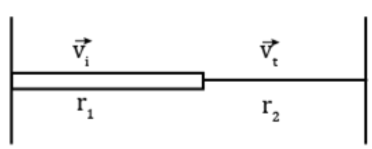
(A)$y = 0.09\sin 8\pi(t - \frac{x}{20})$ **(B)**$y = 0.09\sin 8\pi(t + \frac{x}{20})$

(C)$y = 0.06\sin 8\pi(t + \frac{x}{20})$ **(D)**$y = -0.06\sin 8\pi(t + \frac{x}{20})$

Q.19 A composite string is made up by joining two strings of different mass per unit length r and 4r. The composite string is under the same tension. A transverse wave pulse is sent along the lighter string towards the joint. The ratio of wave number of incident wave to the transmitted wave is

(A)2: 1 **(B)**1: 2 **(C)**3: 2 **(D)**2: 3

Q.20 A wave is travelling from heavier string to a lighter. If the ratio of wavelength of incident to transmitted wave is 1:4, then the ratio of the linear mass density of heavier string to the lighter string is



(A)1:4 **(B)**4: 1 **(C)**1:16 **(D)**16: 1

ANSWER KEY

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