PHYSICS

BOOKS - AAKASH SERIES

WAVES

PROBLEM

1. Given below are some examples of wave motion. State in each case if the wave motion is transverse, longitudinal or a combination of both.

(a) Motion of kink in a longitudinal spring produced by displacing one end of the spring sideways.

(b) Waves produced in a cylinder containing a liquid by moving its piston back and forth.

(c) Waves produced by a motorboat sailing in water.

(d) Ultrasonic waves in air produced by a vibrating quartz crystal.

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2. A progressive wave of frequency 550 Hz is travelling with a velocity of 360 ms How far apart are the two points 60° out of phase ?

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3. A particle is moving along x-direction with a constant acceleration a. The particle starts from $x = x_0$ position with initial velocity u. We can define the position of the particle with time by the relation

$$x = x_0 + ut + \frac{1}{2}at^2$$

plot the position of the particle in relation with time is following situations

(i) If initial position of the particle is on negativ x-axis, initial velocity is positive and acceleration is negative.

(ii) If initial position is positive, initial velocity is negative and acceleration is positive.

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4. The displacement of a wave disturbance propagating in the positive x-direction is given by

$y = \dfrac{1}{1+x^2}$ at $t = 0$ and $y = \dfrac{1}{1+(x-1)^2}$ at $t = 2s$

where, x and y are in meter. The shape of the wave disturbance does not change during the propagation. what is the velocity of the wave?

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5. The wave function of a pulse is given by y= $\dfrac{3}{(2x+3t)^2}$

where x and y are in metre and t is in second

(i) Identify the direction of propagation.

(ii) Determine the wave velocity of the pulse.

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6. Does the wave function $y = A_0 \cos^2(2\pi f_0 t - 2\pi x / \lambda_0)$ represent a wave? If yes, the determine its amplitude frequency, and wavelength.

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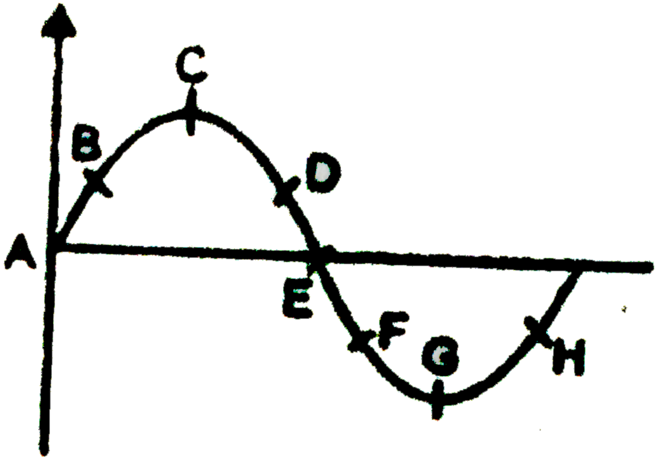
7. A transverse wave is traelling along a string from left to right. The fig. represents the shape of the string (snap-shot) at a given instant. At this instant

(A) Which points have an upward velocity , (B) which points have downward velocity

(C) which point have zero velocity , (D) which point have maximum magnitude of velocity.



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8. A sinusoidal wave trsvelling in the positive direction on a stretched string has amplitude $2.0cm$, wavelength $1.0m$ and velocity $5.0m/s$. At $x=0$ and $t=0$ it is given that $y=0$ and $\frac{\partial y}{\partial t}<0$. Find the wave function $y(x,t)$.

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9. Figure shows a snapshot of a sinusoidal travelling wave taken at $t = 0.3s$.The wavelength is $7.5cm$ and the amplitude is $2cm$. If the crest P was at $x = 0$at $t = 0$, write the equation of travelling wave. ,

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10. The displacement equation of a traveling wave pulse, moving along X axis is given by $y = \frac{8}{4 + x^2} att = 0$ and $att = 1y = \frac{8}{(x^2 - 10x + 29)}$

What is the speed and direction of the pulse?

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11. Check whether, the following equations can represent a progressive (travelling wave)

(a)

$y = A\cos\left(x^3 - vt\right)$ (b) $x = Ae^{(vt-y)}$ (c) $y = A\log\left(\frac{x}{v} - t\right)$

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12. A wave travelling along a string is described by, $y(x, t) = 0.005\sin(80.0x - 3.0t)$, in which the numerical constants are in SI units $\left(0.005m, 80.0\text{rad}m^{-1}\right.$, and $\left.3.0\text{rad}s^{-1}\right)$. Calculate (a) the amplitude, (b) the wavelength, and (c) the period and frequency of the wave. Also, calculate the displacement y of the wave at a distance x = 30.0 cm and time t = 20 s ?

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13. A metal wire of length 1 m has a mass of 33 g. Find the tension required to stretch the wire to propagate a transverse wave along its length, with a speed equal to 1/10 of the speed of sound in air at $0^\circ C$. (Velocity of sound in air at $0^\circ = 330ms^{-1}$)

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14. A copper wire is held at the two ends by rigid supports. At $30^{\circ} C$, the wire is just taut with negligible tension, Find the speed of transverse wave in the wave at $10^{\circ} C$. Given : Coefficient of linear expansion is $1.7 \times 10^{-5} l^{\circ} C$ Young's modulus $= 1.3 \times 10^{11} \mathrm{N/m}^2$ Density $= 9 \times 10^3 \mathrm{~kg\,m}^{-3}$.

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15. A 4.0 kg block is suspended from the ceiling of an elevator through a string having a linear mass desity of $19.2 \times 10^{-3} kgm^{-1}$. Find the speed (with respect to the string) with which a wave pulse can proceed on the string if the elevator accelerates up at the rate of $2.0ms^{-2}. Takeg = 10ms^{-2}$.

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16. A uniform thin rope of length 12 m and mass 6 kg hangs vertically from a rigid support and block of mass 2kg is attached to its free end. A transverse short wave-train of wavelength 6 cm is produced at the lower end of the rope. What is the wavelength of the wavetrain (in cm) when it reaches the top of the rope?

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17. A wave pulse starts propagating in the +x-direction along a non-uniform wire of length 10 m with mass per unit length given by $\mu = \mu_0 + ax$ and under a tension of 100 N. find the time taken by a pulse to travel from the lighter end (x=0) to the heavier end. $\mu_0 = 10^2 kg/m$ and a=9x10^(-3) kg/m^(2).

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18. A thin string is held at one end and oscillates so that,

$y(x = 0, t) = 8 \sin 4t (cm)$

Neglect the gravitattional force. The string's linear mass density is $0.2 kg/m$ and its tension is $1N$. The string passes through a bath filled with $1 kg$ water. Due to friction heat is transferred to the bath. The heat transfer efficiency is 50%. Calculate how much time passes before the temperature of the bath rises one degree kelvin?

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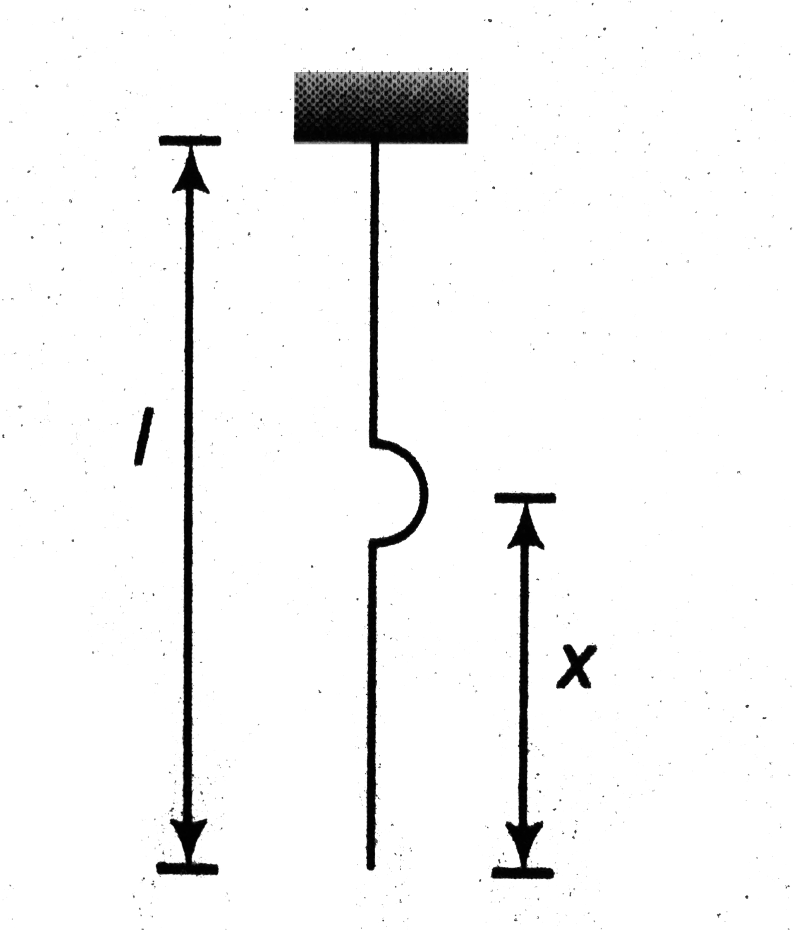
19. A uniform rope of mass $0.1kg$ and length $2.45m$ hangs from a ceiling.

(a) Find the speed of transverse wave in the rope at a point $0.5m$ distant from the lower end.

(b) Calculate the time taken by a transverse wave to travel the full length of the rope.



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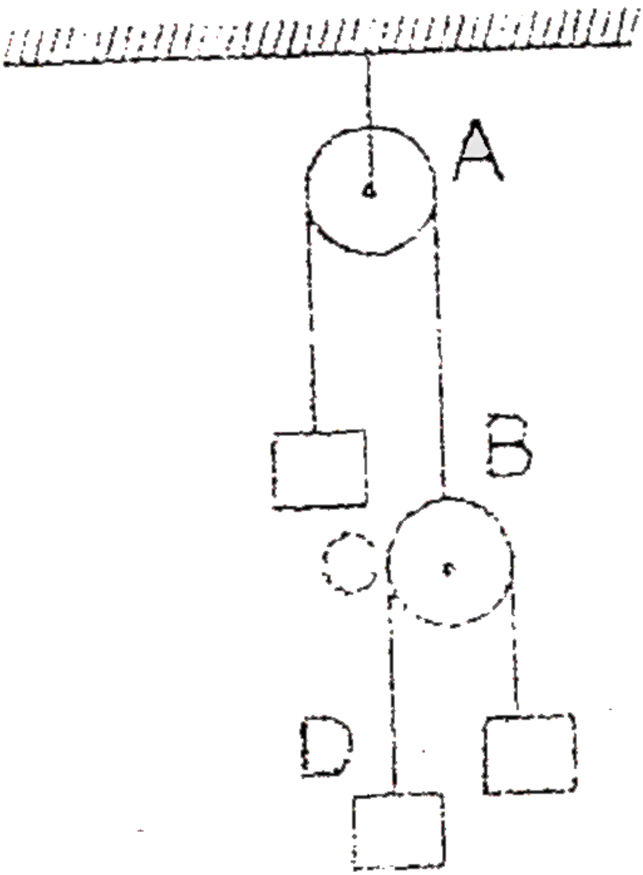
20. Both the strings, shown in figure, are made of same material and have same cross-section. The pulleys are light. The wave speed of transverse wave in the string AB is v_1 and in CD it is v_2, the v_1 / v_2 is



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21. A steel wire 0.72 m long has a mass of 5.0×10^{-3} kg. If the wire is under a tension of 60 N, what is the speed of transverse waves on the wire ?

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22. Find the speed of sound in a mixture of 1 mol of helium and 2 mole of oxygen at $27^{\circ} C$.

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23. A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that the escape velocity from the earth is 11 km s^{-1} , the escape velocity from the surface of the planet would be $x \times 11$ km/s. Find x.

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24. The coordinates of a particle moving in a plane are given by x (t) = a cos (pt) and y (t) = b sin (pt), where a, b ($<$ a), and p are positive constants of appropriate dimensions. Then:

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25. The vibrations of a string of length 60 cm fixed at both ends are represented by the equation $y = 4\sin\left(\frac{\pi x}{15}\right)\cos(96\pi t)$, where x and y are in cm and t in seconds.

(a)What is the maximum displacement of a point at $x = 5cm$?

(b)Where are the nodes located along the string?

(c)What is the velocity of the particle at x=7.5cm and t=0.25s?

(d)Write down the equations of the component waves whose superposition gives the above wave.

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26. A guitar string is 90 cm long and has a fundamental frequency of 124 Hz. Where should it be pressed to produce a fundamental frequency of 186 Hz?

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27. A wire having a linear mass density $5.0 \times 10^{-3} kg/m$ is stretched between two rigid supports with a tension of 450 N. The wire resonates at a frequency of 420 Hz. The next higher frequency at which the same wire resonates is 490 Hz. Find the length of the wire.

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28. The equation of a standing wave produced on a string fixed at both ends is $y = 0.4\sin\frac{\pi x}{10}\cos 600\pi t$ where y' is measured in om 10 What could be the smallest length of string?

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29. The equation for the vibration of a string, fixed at both ends vibrating in its third harmonic, is given by $y = (0.4cm)\sin\left[\left(0.314cm^{-1}\right)x\right]\cos\left[f\left(600\pi s^{-1}\right)t\right]$.(a) What is the frequency of vibration ? (b) What are the positions of the nodes ? (c) What is the length of the string ? (d) What is the wavelength and the speed of two travelling waves that can interfere to give this vibration ?

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30. A sonometer wire has a length 114 cm between two fixed ends. Where should two bridges be placed to so as divide the wire into three segments whose fundamental frequencies are in the ratio 1:3:4 .

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31. A string $120cm$ in length sustains a standing wave with the points of the string aat which the displacement amplitude is equal to $3.5mm$ being separated by $15.0cm$. Find the maximum displacement amplitude . To which overtone do these oscillations correspond ?

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32. A string fixed at both ends has consecutive standing wave modes for which the distances between adjacent nodes are 18 cm and 16 cm, respectively.

(a) What is the minimum possible length of the string?

(b) If the tension is 10 N and the linear mass density is 4 g/m, what is the fundamental frequency?

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33. A wire of length 1m and mass 20g is stretched with a force of 800 N. Find the fundamental frequency. Also find the frequencies of the first two Overtones.

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34. A wire of uniform cross-section is stretched between two points $100 cm$ apart. The wire is fixed at one end and a weight is hung over a pulley at the other end. A weight of 9kg produces a fundamental frequency of $750 Hz$.

(a) What is the velocity of the wave in wire?

(b) If the weight is reduced to $4 kg$, what is the velocity of wave?

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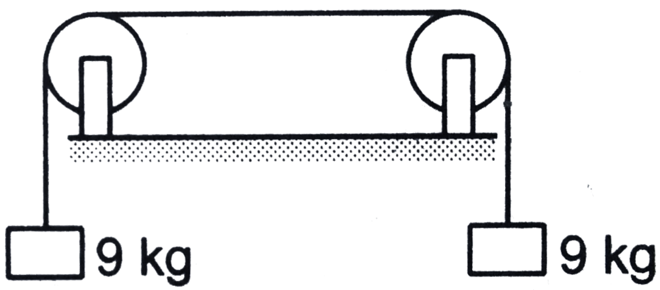
35. The length of the wire shown in figure between the pulley is 1.5 m and its mass is 12.0 g. Find the frequency of vibration with which the wire vibrates in two loops leaving the middle point of the wire between the pulleys at rest.



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36. An aluminium wire of cross-sectional area $(10^{-6})m^2$ is joined to a steel wire of the same cross-sectional area.

This compound wire is stretched on a sonometer pulled by a weight of 10kg. The total length of the compound wire between the bridges is 1.5m of which the aluminium wire is $0.6m$ and the rest is steel wire. Transverse vibrations are setup in the wire by using an external source of variable frequency. Find the lowest frequency of excitation for which the standing waves are formed such that the joint in the wire is a node. What is the total number of nodes at this frequency? The density of aluminium is $2.6 \times \left(10^{3}\right) kg/m^{3}$ and that of steel is $1.04 \times 10^{4} kg/m^{2} \left(g = 10m/s^{2}\right)$

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37. A wire of density 9×10^{-3} kg cm^{-3} is stretched between two clamps 1 m apart. The resulting strain in the wire is4.9×10^{-4} . The lowest frequency of the transverse vibrations in the wire is (Young's modulus of wire Y= $9 \times 10^{10} \mathrm{nm}^{-2}$) , (to the nearest integer), ______.

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38. A steel wire of length 1 m, mass 0.1 kg and uniform cross-sectional area $10^{-6} m^2$ is rigidly fixed at both ends. The temperature of wire is lowered by 20°C. If transverse waves are set up by plucking the string in the middle, calculate the frequency (In S.I. units) of the fundamental mode of vibration. Young's modulus of steel

$= 2 \times 10^{11} N/m^2$, coefficient of linear expansion of steel $= 1.21 \times 10^{-6} (degC)^{-1}$.

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39. Third overtone of a closed organ pipe is in unison with fourth harmonic of an open organ pipe . Find the ratio of the lengths of the pipes.

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40. For a certain organ pipe, three successive resonance frequencies are observer at 425, 595 and $765 H_Z$ respectively. Taking the speed of sound in air to be

$340m/s$, (a) explain whether the pipe is closed at one or open at boyh ends. (b) determine the fundamental frequency and length of the pipe.

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41. A tube $1.0m$ long is closed at one end. A stretched wire is placed near the open end. The wire is $0.3m$ long and a mass of $0.01kg$. It is held fixed at both ends and vibrates in its fundamental mode. It sets the air column in the tube into vibration at its fundamental frequency by resonance. Find

(a) the frequency of oscillation of the air column and

(b) the tension in the wire.

Speed of sound in air = $330m/s$.

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42. The length of a pipe open at both ends is 48 cm and its fundamental frequency is 320 Hz. If the speed of sound be $320ms^{-1}$ then determine the diameter of the pipe. If one end of the pipe be closed, then what will be the fundamental frequency?

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43. A cylinder of length $1m$ is divided by a thin perfectly flexible diaphragm in the middle. It is closed by similar flexible diaphragams at the ends. The two chambers into which it is divided contain hydrogen and oxygen. The two diaphragms are set in vibrations of same frequency. What is the minimum frequency of these diaphragms for which the middle diaphragm will be motionless? Velocity of sound in hydrogen is $1100m/s$ and that in oxygen is $300m/s$.

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44. A tuning fork of frequency $340Hz$ is excited and held above a cylindrical tube of length $120cm$. It is slowly filled with water. The minimum height of water column required for resonance to be first heard(Velocity of sound $= 340ms^{-1}$) is.

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45. A pipe of length 1.5m closed at one end is filled with gas and resonates in its fundamental mode with a tuning fork. Another open organ pipe of same dimensions filled with air resonates in its fundamental mode with the same tuning fork. If this experiment is performed at $30^{\circ} C$,then the speed of sound at $0^{\circ} C$ in the same gas is (Speed of sound in air is $360 m / s$)

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46. A closed organ pipe of length L and an open organ pipe contain gasses of densities ρ_1 and ρ_2, respectively. The compressibility of gasses are equal in both the pipes. Both the pipes are vibrating in their first overtone with same frequency . The length of the open organ pipe is

(a) $\frac{L}{3}$

$\frac{4l}{3}$

(c) $\frac{4l}{3}\sqrt{\frac{\rho_1}{\rho_2}}$

(d) $\frac{4l}{3}\sqrt{\frac{\rho_2}{\rho_1}}$

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47. An open pipe is in resonance in 2nd harmonic with frequency f_1. Now one end of end of the tube is closed and frequency is increased to f_2 such that the resonance again occurs in nth harmonic. Choose the correct option.

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48. If two sound waves, $y_1 = 0.3 \sin 596\pi[t - x/330]$ and $y_2 = 0.5 \sin 604\pi[t - x/330]$ are superposed, what will be the (a) frequency of resultant wave (b) frequency at which the amplitude of resultant waves varies (c) frequency at which beats aer produced. Find also the ratio of maximum and minimum intensities of beats.

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49. The frequency of the funing fork B is 512Hz. It is sounded with another tuning fork. A and 4 beats per sec are heard. A is filled and it is found that beats occur at shorter intervals. Find the frequency of A?

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50. Two identical sonometer wires have a fundamental frequency of $500Hz$ when kept under the same tension . The percentage change in tension of one of the wires that would cause an occurrence of $5beats / s$, when both wires vibrate together is

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51. Two open organ pipes 80 and 81 cm long found to give 26 beats in 10 sec, when each is sounding its fundamental note. Find the velocity of sound in air.

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52. A tuning fork 'A' produces 6 beats per second with another fork 'B'. On loading 'B' with a little wax, it produces 5 beats per second with 'A'. If the frequency of 'A'is 256 Hz find the frequency of 'B?.

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53. Two sound waves of lengths 9 and 10 metres produce 34 beats in 9 seconds. Find the velocity of sound.

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54. The frequency of a tuning fork A is 5% greater than that of a standard fork K. The frequency of another fork B is 3% less than that of K. When A and B are vibrated simulataneously 4 beats per second are heard. Find the frequencies of A and B.

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55. Two forks A and B when sounded together produce 4 beat/s. The fork A is in unison with 30 cm length of a sonometer wire and B is in unison with 25 cm length of the same wire at the same tension Calculate the frequency of the forks.

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56. A stretched sonometer wire is in unison with a uning fork. When the length is increased by 2% the number of beats per second is 5. Find the frequency of the forks.

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57. Weight of a body of mass m decreases by 1% when it is raised to height h above the earth's surface. If the body is taken to a depth h in a mine, change in its weight is:

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58. A metal wire of diameter $1mm$, is held on two knife edges separated by a distance of $50cm$. The tension produces 5 beats per sec. The tension in the wire is then reduced to $81N$. When the are excited, beats are again at the same rate. Calculate

(a) The frequency of the fork , (b) The density of the material of the wire.

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59. the fundamental frequency of a sonometer wire of length is f_0.A bridge is now introduced at a distance of $\Delta l$from the centre of the wire $(\Delta l < < l)$. The number of beats heard if their fundamental mode are

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60. The length of two open pipes are l and $(l + \Delta i)$ respectively. Neglecting end correction the frequency of beats between them will be approximately

(Here v is the speed of sound)

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61. An underwater swimmer sends a sound signal to the surface. If it produces 5 beats per second when compared with the fundamental tone of a pipe of 20 cm length closed at one end, what is the wavelength of sound in water?

$(\text{Take} v_{\text{water}} = 1500 m/s \text{ and } v_{\text{air}} = 360 m/s)$

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62. A column of air at $51^{\circ} C$ and a tuning fork p-roduce $4 beats / s$ when sounded together . As the temperature of air column is decreased the number of beats per second tends to decrease and when temperature is 16° the two produce $1 beat / \sec ond$. Find the frequency of tuning fork.

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63. A string $25 cm$ long and having a mass of $2.5 g$ is under tension. A pipe closed at one end is $40 cm$ long . When the string is set vibrating in its first overtone and the air in the pipe in its fundamental frequency, 8 beats per second are heard . It is observed that decreasing the tencion in the string decrease the beat frequency. If the speed of sound in air is $320m/s$, find the tension in the string.

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64. A railway engine moving with a speed of 60 m/s passes in front of a stationary listener. The real frequency of the whistle is 400 Hz. Calculate the apparent frequency heard by the listener

(a) When the engine is approaching the listener

(b) When the engine is moving away from listener (V=340 m/s)

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65. A siren emitting a sound of frequency $1000H_Z$ moves away from you towards a cliff at a speed of $10m/s$.

(a) What is the frequency of the sound you hear coming directly from the sirven ?

(b) What is the frequency of sounds you hear reflected off the cliffb ?

(c) What beat frequency would you hear ? Take the speed of sound in air as $330m/s$.

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66. When a train is approaching the observer, the frequency of the whistle is 100 cps. When it has passed the observer, it is 50 cps. The frequency when the observer moves with the train, is :

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67. A whistle of frequency $540H_Z$ rotates in a circle of radius $2m$at a linear speed of $30m/s$. What is the lowest and highest frequency heard by an observer a long distance away at rest with respect to the centre of circle ? Take speed of sound of sound in air as $330m/s$. Can the apparent frequency be ever equal to actual ?

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68. Two tuning forks with natural frequencies 340 Hz each move relative to a stationary observer. One fork moves away from the observer, while the other moves towards the observer at the same speed. The observer hears beats of frequency 3 Hz. Find the speed of the tuning forks (speed of sound is $340\frac{m}{s}$).

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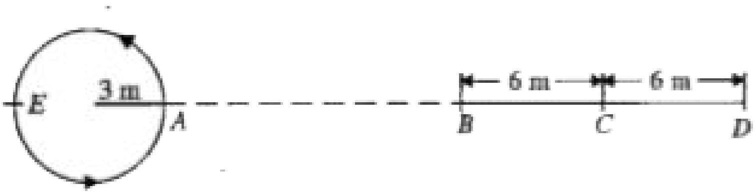
69. A source of sound is moving along a circular orbit of radius 3 m with an angular velocity of 10 rad/s. A sound detector located far away from the source is executing linear S.H.M. along the line BD (see Fig. 14.4.13) with an

amplitude BC = CD=6m. The frequency of oscillation of the detector is $5/\pi$ per second. The source is at the point BA when the detector is at the point B. If the source epiits a continuous sound wave of frequency 340 Hz, find the maximum and the minimum frequencies recorded by the detector.



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70. A car approaching a crossing C at a speed of $20m/s$ sounds a horn of frequency $500H_Z$ when $80m$ from the crossing . Speed of sound in air is $330m/s$. What frequency is heard by an observer (at rest) $60m$ from the crossing on the straight road which crosses car road at right angles ?

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71. A sonometer wire under tension of 64 N vibrating in its fundamental mode is in resonance with a vibrating tuning fork. The vibrating portion of the sonometer wire has a length of 10 cm and mass of 1 g. The vibrating tuning fork is now moved away from the vibrating wire with a constant speed and an observer standing near the sonometer hears one beat per second. Calculate the speed with which the tuning fork is moved, if the speed of sound in air is 300 m/s.

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72. A circular beam of light of diameter (width) falls on a plane surface of glass. The angle of incidence is .I., angle of refraction is .r. and refractive index of glass is μ. Then the diameter of the refracted beam d. is.......

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73. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm?

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74. In YDSE , the interfering waves have amplitude in the ratio 3 : 2. Find the ratio of maximum and minimum Amplitude of resultant wave.

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75. The ratio of distance of two satellites from the centre of earth is 1 : 4. The ratio of their time periods of rotation will be :

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76. Two coherent sources are $0.18mm$ apart and the fringes are observed on a screen 80 cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of $10.8mm$ from the central fringe. Calculate the wavelength of light.

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77. In YDSE, the two slits are separated by $0.1mm$ and they are $0.5m$ from the screen. The wavelenght of light used is $5000A^0$. Find the distance between 7th maxima 11th minima on the screen.

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78. In Young's double slit experiment how many maximas can be obtained on a screen (including the central maximum) on both sides of the central fringe it $\lambda = 2000A^0$ and $d = 7000A^0$.

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79. In Young.s double-slit experiment using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path difference is λ, is K units. What is the intensity of light at a point where path difference is $\lambda/3$?

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80. A certain mass of substance in 10 g of benzene lowers the freezing point by $1.28^\circ C$ and in 100 g of water lowers the freezing point by $1.395^\circ C$ separately. If the substance has normal molecular weight in benzene and completely dissociated in water, calculate number of moles of ions formed by its 1 mole dissociation in water $\left(K_{f_{\text{water}}} = 1.86, K_{f_{\text{benzene}}} = 5.00\right)$

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81. In a double-slit experiment the angular width of a fringe is found to be 0.2^0 on a screen placed 1 m away. The wavelenght of light used is 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water? Take refractive index of water to be $4/3$.

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82. A beam of light consisting of two wavelengths $6500A^0$ and $5200A^0$ is used to obtain interference fringes in a Young's double slit experiment.

Find the distance of the third bright fringe on the screen from the central maximum for wavelength $6500A^0$. The distance between the slits is 2mm and the distance between the plane of the slits and the screen is 120 cm.

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83. A beam of light consisting of two wavelengths $6500A^0$ and $5200A^0$ is used to obtain interference fringes in a Young.s double slit experiment.

What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? Distance between the slits is 2mm, distance between the slits and the screen $L = 120cm$.

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84. The maximum intensity in the case of n identical incoherent waves each of intensity $2\frac{W}{m^2}$ is n $32\frac{W}{m^2}$ the value of n is.

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85. In YDSE, bichromatic light of wavelengths 400 nm and 560 nm

are used. The distance between the slits is 0.1 mm and the distance between the

plane of the slits and the screen is 1m. The minimum distance between two

successive regions of complete darkness is

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86. The maximum intensity in Young.s double slit experiment is I_0. Distance between slits is $d = 5\lambda$, where λ is the wavelenght of the monochromatic light used in the experiment. What will be the intensity of light in front of one of the slits on a screen at a distance $D = 10d$.

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87. Compare the intensities of two points located at respective distance $\frac{\beta}{4}$ and $\frac{\beta}{3}$ from the central maixma in a interference pattern of YDSE (β is the fringe width).

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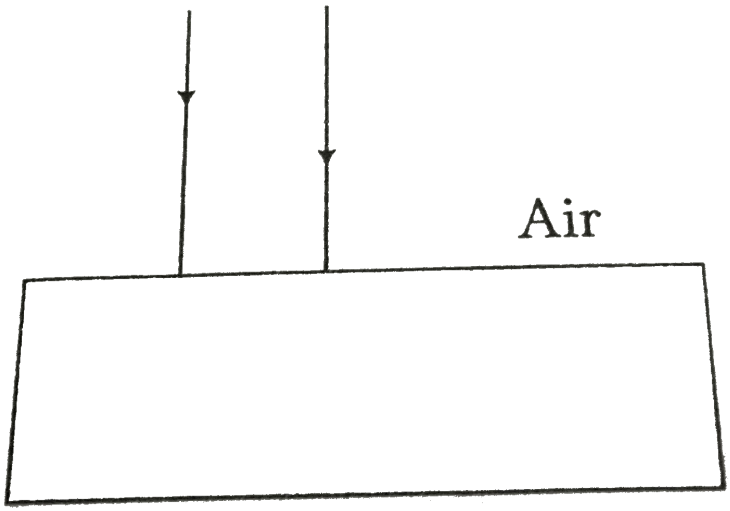
88. A parallel beam of light of intensity I is incident on a glass plate. 25% of light is reflected in any reflection by upper surface and 50% of light is reflected by any reflection from lower surface. Rest is refracted The ratio of maximum to minimum intensity in interference region of reflected rays is



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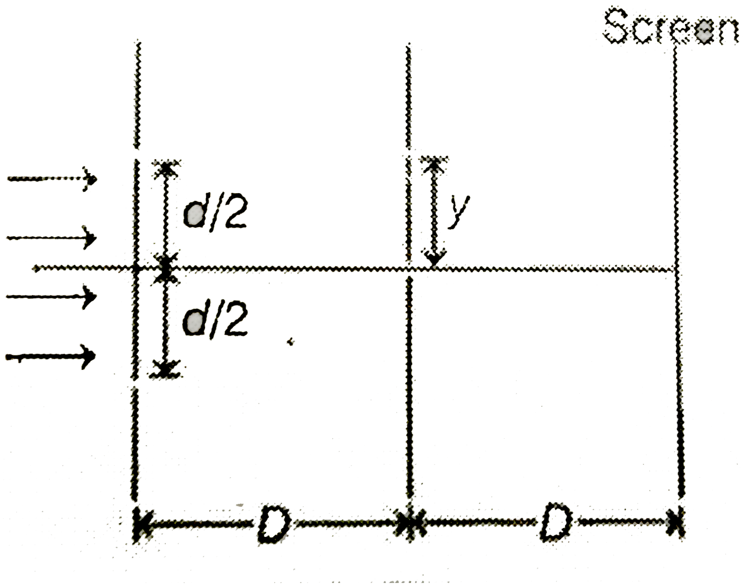
89. In the Young's double slit experiment apparatus shown in figure, the ratio of maximum to minimum intensity on the screen is 9. The wavelength of light used is λ, then the value of y is



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90. In Young.s double slit experiment intensity at a point is $(1/4)$ of the maximum intensity. Angular position of this points is

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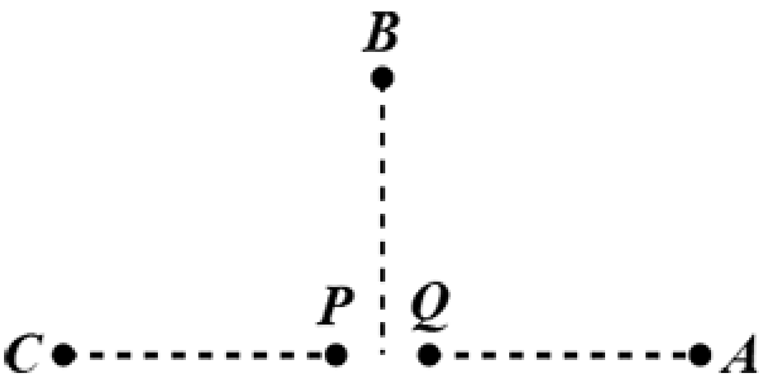
91. Fig, here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20m. The separation PQ si 5m, and phase of P is ahead of the phase Q by 90°. A, B and C are three distant points of observation equidistant from the mid - point of PQ. The intensity of radiations of A, B, C will be in the ratio



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92. In YDSE $a = 2mm$, D = 2m, $\lambda = 500$ nm. Find distance of point on screen from central maxima where intensity becomes 50% of central maxima

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93. A current I is flowing in a straight conductor of length L. The magnetic induction at a point distant $\frac{L}{4}$ from its centre will be

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94. White coherent light (400 nm- 700 nm) is sent through the slits of a young.s double slit experiment.

The separation between the slits is $0.5mm$ and the screen is 50 cm away from the slits. There is a hole in the screen at a point 1 mm from the centre.

In the above problem which wavelength have a strong intensity at the hole?

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95. Two coherent sources are 0.15 mm apart and fringes are observed 1m away with monochromatic light of wavelength 6000^{0}. Find

The fringe width in air.

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96. Two coherent sources are 0.15 mm apart and fringes are observed 1m away with monochromatic light of wavelength 6000^0. Find

The fringe width in a liquid of refraction index $5/2$.

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97. Young's double slit experiment is made in a liquid. The tenth bright fringe in liquid lies in screen where 6th dark fringe lies in vacuum. The refractive index of the liquid is approximately

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98. In Young's double-slit experiment, the y-coordinate of central maxima and 10th maxima are 2 cm and 5 cm, respectively, When the YDSE apparatus is immersed in a liquid of refractive index 1.5, the corresponding y-coordinates will be

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99. A plate of thickness t made of a material of refractive index μ is placed in front of one of the slits in a double slit experiment. (a) Find the changes in he optical path due to introduction of the plate. (b) Wht should be the minimum thickness t which will make the intensity at the centre of the fringe pattern zero ? Wavelength of the light used is λ. Neglect any absorption of light in the plate.

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100. In a Young.s double slit experiment, the fringes are displaced by a distance x when a glass plate of refractive index 1.5 is introduced in the path of one of the beams. When this plate is replaced by another plate of same thickness, the shift of fringes is $(3/2)x$. The refractive index of second plate is

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101. A thin sheet of a transparent material $(\mu = 1.60)$ is placed in the path of one of the interfering beams in a YDSE using sodium light, $\lambda = 5890\dot{A}$. The central fringe shifts to a position originally occupied by the 12th bright fringe. Calculate the thickness of the sheet.

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102. A double - slit apparatus is immersed in a liquid of refractive index 1.33 it has slit separation of 1mm and distance between the plane of slits and screen 1.33 m the slits are illuminated by a parallel beam of light whose wavelength in air is 800 nm.

(i) Calculate the fringe width.

(ii) One of the slits of apparatus is covered by a thin glass sheet of refractive index 1.53 Find the smallest thickness of the sheet to bring the adjacent minima on the axis.

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103. A double - slit apparatus is immersed in a liquid of refractive index 1.33 it has slit separation of 1mm and distance between the plane of slits and screen 1.33 m the slits are illuminated by a parallel beam of light whose wavelength in air is 800 nm.

(i) Calculate the fringe width.

(ii) One of the slits of apparatus is covered by a thin glass sheet of refractive index 1.53 Find the smallest thickness of the sheet to bring the adjacent minima on the axis.

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104. YDSE is carried out in a liquid of refractive index $\mu = 1.3$ and a thin film of air is formed in front of the lower slit as shown in the figure. If a maxima of third order is formed at the origin O, find the thickness of the air film. Find the positions of the fourth maxima. The wavelength of light is air is $\lambda_0 = 0.78 \mu m$ and $D / d = 1000$. (##DCP_V05_C32_E01_086_Q01.png" width="80%">

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105. YDSE is carried out in a liquid of refractive index $\mu = 1.3$ and a thin film of air is formed in front of the lower slit as shown in the figure. If a maxima of third order is formed at the origin O, find the thickness of the air film. Find the positions of the fourth maxima. The wavelength of light is air is $\lambda_0 = 0.78 \mu m$ and $D/d = 1000$. (##DCP_V05_C32_E01_086_Q01.png" width="80%">

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106. An interference is observed due to two coherent sources S_1 placed at origin and S_2 placed at $(0, 3\lambda, 0)$. Here, lambda is the wavelength of the sources. A detector D is moved along the positive x-axis. Find x-coordinates on the x-axis (excluding $x = 0$ and $x = \infty$) where maximum intensity is observed.

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107. Two coherent fight sources A and B with separation 2λ are placed on the x-axis symme-trically about the origion. They emit light of wavelength λ. Obtain the positions of maxima on a circle of large radius, lying in the x-y plane and with centre at the origion.

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108. Two coherent point sources S_1 and S_2 vibrating in phase light of wavelength λ. The separation between the sources is 2λ. The smallest distance from S_2 on a line passing through S_2 and perpendicular to s_1s_2 where a minimum of intensity occurs is

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109. In an arrangement of double slit arrangement fig. The slits are illuminated by light of wavelenth 600 mm. The distance of the first point on the screen from the centre maximum where intensity is 75% of central maximum is

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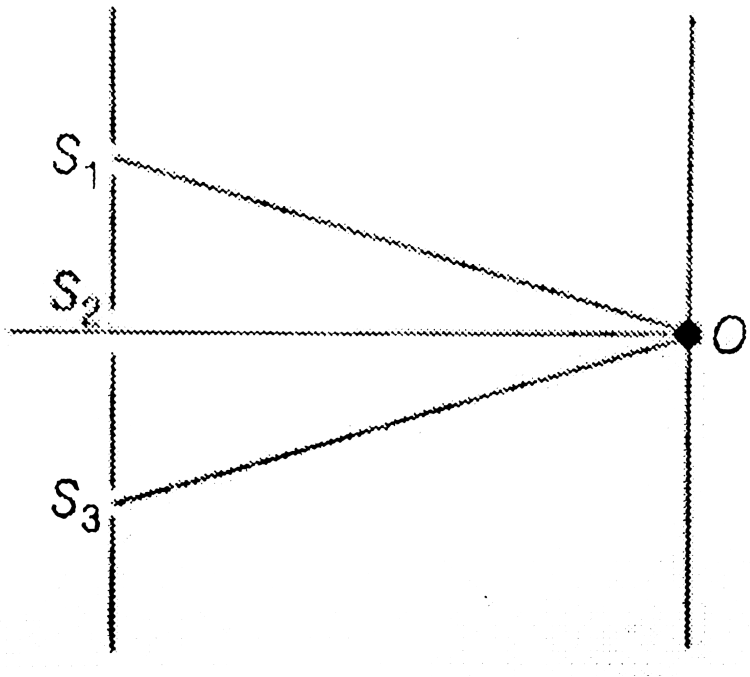
110. In the figure shown $S_1O - S_2O = S_3O - S_2O = \frac{\lambda}{4}$, Intensity at O due to any one of the slits is I_0. What is the intensity due to all the three coherent sources S_1, S_2 and S_3 ?



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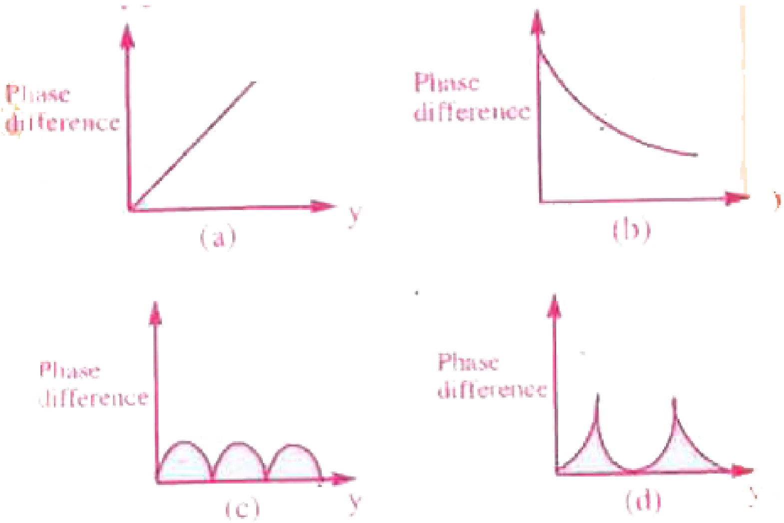
111. Which of the following graphs best represent the variation of phase difference between he interferring waves in a double slit experiment with the distance from the central maximum?



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112. The graph between the path difference versus phase difference is a/an

1) straight line 2) parabola 3) sine curve 4) none of these

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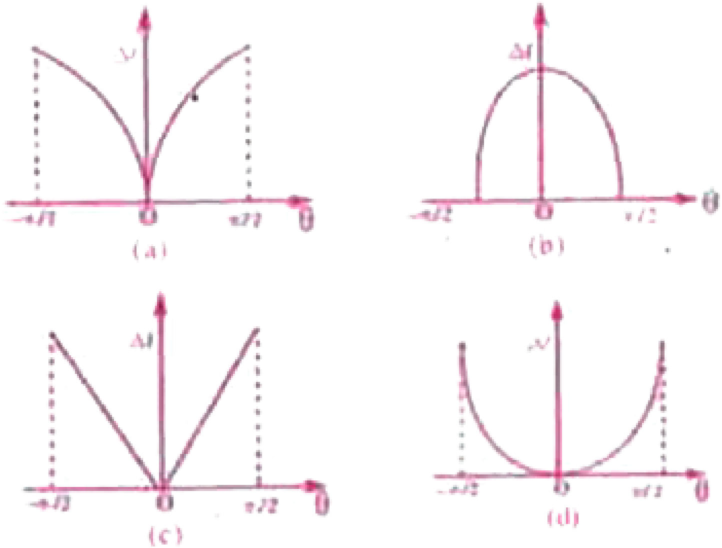
113. Which of the following graphs represent the variation of the path difference $(\triangle l)$ between the interferring waves in a double slit experiment with the

.angular position. (θ) of the point on the screen?



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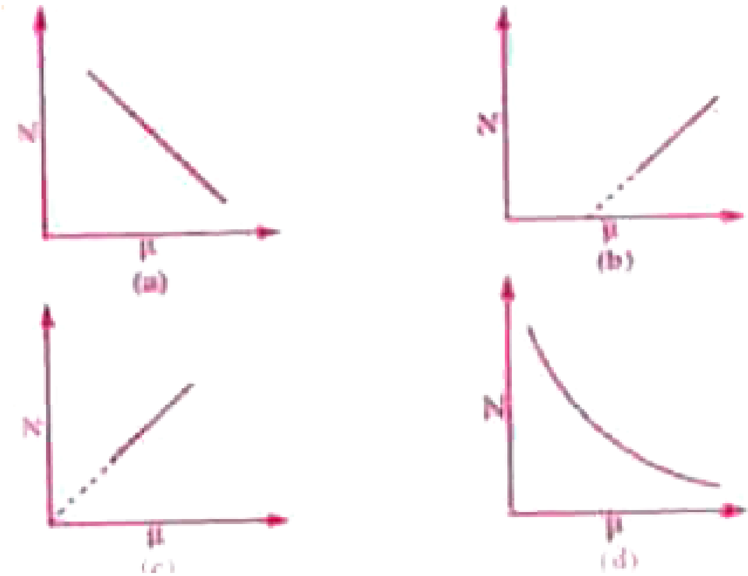
114. A Young.s double slit experiment set up is completely submerged in a transparent liquid. Which of the following graphs best represent the variation of total number of fringes N observed on the screen with the index of referring μ of the liquid?



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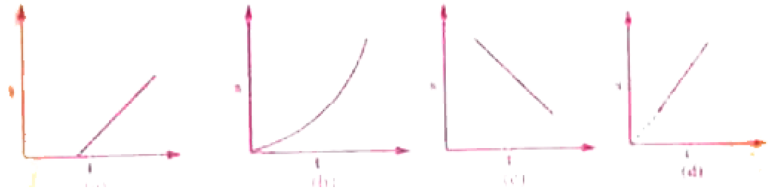
115. The graph between the shifts of the interferring pattern in a double slit experiment with the thickness t of a transparent slab introduced in front of one of the

slits is best represented by



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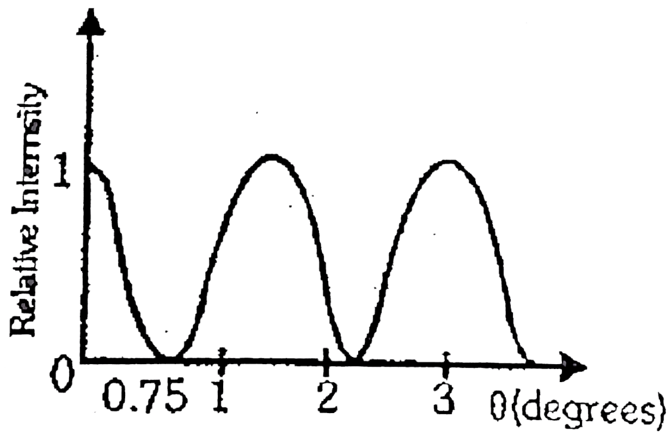
116.



Light of wavelength 520 nm passing through a double slit, produces interference pattern of relative intensity versus deflection angle θ as shown in the figure. Find the separation d between the slits.

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117. What is the effect on the interference fringes in a Young's double-slit experiment due to each of the following operations:

(a) the screen is moved away from the plane of the slits,

(b) the (monochromatic) source is replaced by another (monochromatic) source of shorter wavelength,

(c) the separation between the two slits is increased

(d) the source slit is moved closer to the double-slit plane,

(e) the width of the source slit is increased (f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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118. What is the effect on the interference fringes in a Young's double-slit experiment due to each of the following operations:

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(e) the width of the source slit is increased

(f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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119. What is the effect on the interference fringes in a Young's double-slit experiment due to each of the following operations:

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(c) the separation between the two slits is increased

(d) the source slit is moved closer to the double-slit plane,

(e) the width of the source slit is increased

(f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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120. What is the effect on the interference fringes in a Young's double-slit experiment due to each of the following operations:

(a) the screen is moved away from the plane of the slits,

(b) the (monochromatic) source is replaced by another (monochromatic) source of shorter wavelength,

(c) the separation between the two slits is increased

(d) the source slit is moved closer to the double-slit plane,

(e) the width of the source slit is increased

(f) the monochromatic source is replaced by a source of white light? (In each operation, take all parameters, other than the one specified, to remain unchanged.)

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121. What is the effect on the interference fringes in a Young.s double-slit experimental due to each of the following operations :

The width of the source slit is increased.

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122. What is the effect on the interference fringes in a Young.s double-slit experimental due to each of the following operations :

The monochromatic source is replaced by a source of white light?

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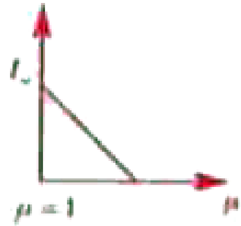
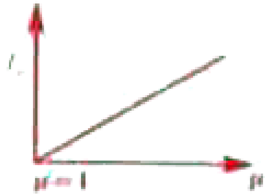
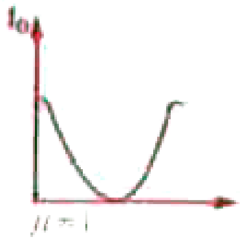
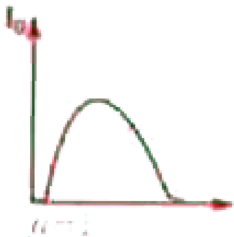
123. In a YDSE if a slab whose refractive index can be varied is palced in fron of one of the slits then the variation of resultant intensity of mid-point of screen with μ will be represented by (assume slits of equal width and there is no absorption by slab)

1) 

2) 

3) 

4) 

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124. A galaxy moves with respect to us so that sodium light of 589.0 nm is observed at 589.6 nm. The speed of the galaxy is

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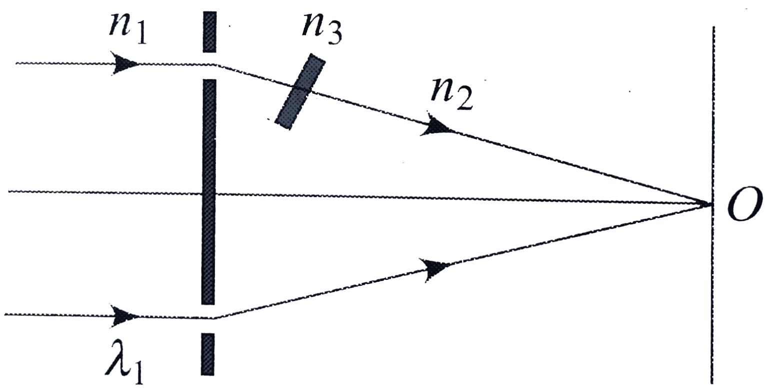
125. In YDSE shown in figure a parallel beam of light is incident on the slits from a medium of refractive index n_1. The wavelength of light in this medium is λ_1. A transparent slab of thickness t and refractive index n_3 is put in front of one slit. The medium between the screen and the plane of the slits is n_2. The phase difference between the light waves reaching point O (symmetrical, relative to the slits) is



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126. Explain the following giving reasons :

(i) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency.

(ii) When ligjt travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a reduction in the energy carried by the wave ?

(iii) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity in the photon picture of light ?

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127. When light travels from a rarer to a denser medium , the speed decreases . Does this decrease in speed imply a decrease in the energy carried by the light wave ? Justify your answer .

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128. Explain the following giving reasons :

(i) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency.

(ii) When ligjt travels from a rarer to a denser medium, the speed decreases. Does this decrease in speed imply a reduction in the energy carried by the wave ?

(iii) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity in the photon picture of light ?

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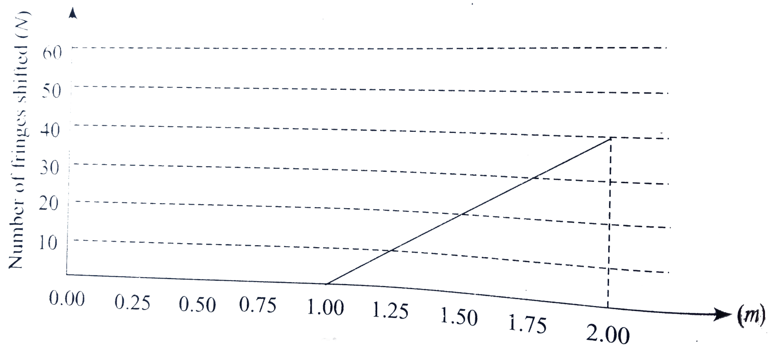
129. The slits in a double-slit interference experiment are illuminated by orange light $(\lambda = 60nm)$. A thin transparent plastic of thickness t is placed in front of one of the slits. The nunber of fringes shifting on screen is plotted versus the refractive index μ of the plastic in

graph shown in figure. The value of t is



A. $8.8mm$

B. $649\mu m$

C. $24\mu m$

D. $600nm$

Answer: C

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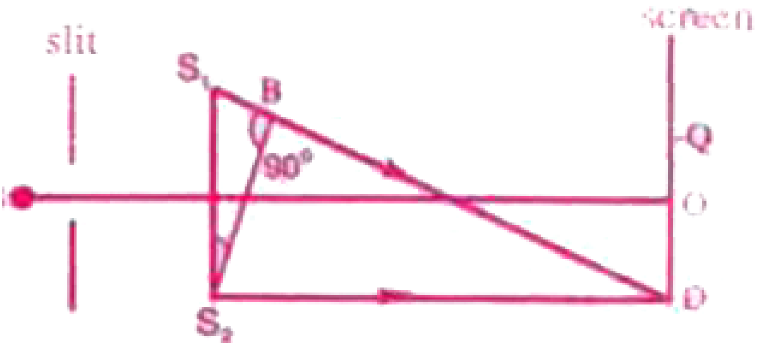
130. As shown in the figure Q, above point O is the position of first bright fringe. On the other side of O, D is the position of 11th bright fringe with respect to Q. If the wavelength of light used is $6000A^0$ then the value of S_1B will be



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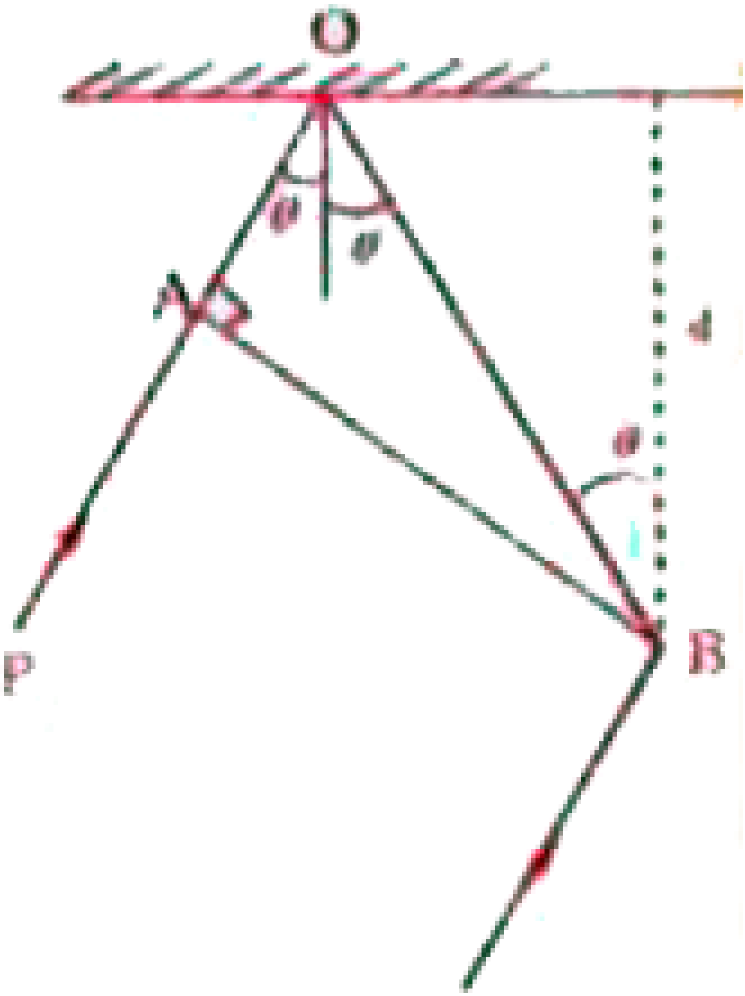
131. In the figures PO and QB are the extreme rays of a wavefront AB of monochromatic light of wavelength λ.

The value of angle θ for which the ray QB and ray OB interference constructively is



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132. A parallel beam of light of 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of the screen. Calculate the width of the slit.

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133. A screen is placed 50 cm from a single slit which is illuminated with light of wavelength 6000 Ã.... If the distance between the first and third minima in the diffraction pattern is 3.0 mm. The width of the slit is

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134. In a single slit diffraction experiment first minima for $\lambda_1 = 660nm$ coincides with first maxima for wavelength λ_2. Calculate the value of λ_2.

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135. In double slit experiment what should be the width of each slit to obtain 10 maxima of the double slit pattern within the central maxima of single slit pattern with d=2 mm.

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136. Calculate the smallest angular separation resolved by the human eye, given : aperature $= 2.5mm$ and effectived $\lambda = 5500\dot{A}$. If a scale with mm markings is viewed by the unaided eye, deduce the largest distance to which the markings will be visible.

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137. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch

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138. Three mass points each of mass m are placed at the vertices of an equilateral triangle of side l. What is the gravitational field and potential at the centroid of the triangle due to the three masses?

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139. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900cm$. Find

What effect would this have on the resolving power, if water $(\mu = 1.33)$ fills the space between the object and objective.

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140. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900cm$. Find

The limiting angle of resolution.

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141. Light of wavelength 589 nm is used to view an object under a microscope. The aperature of the objective has a diameter of $0.900cm$. Find

What effect would this have on the resolving power, if water $(\mu = 1.33)$ fills the space between the object and objective.

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142. In Kepler's law of periods $T^2 = kr^3$, the constant $k = 10^{-13} s^2 m^{-3}$. Express the constant k in days and kilometers. The moon is at a distance of 3.84×10^5 km from the earth. Obtain its time period of revolution in days.

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143. A microscope has objective of aperture 8mm and focal length $2.5cm$. Estimate its resolving power. Given $\lambda = 5500\dot{A}$.

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144.

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145. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?

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146. Two towers on top of two hills are 40 km apart. The line joining them passes 50 m above a hill halfway between the towers. What is the longest wavelength of radio waves, which can be sent between the towers without appreciable diffraction effects?

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147. When light of particular wavelength falls on a plane surface at an angle of incidence 60° then the reflected light becomes completely plane polarized Find the refractive index of surface material and the angle of refraction through it.

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148. When light of a certain wavelength is incident on a plane surface of a material at a glancing angle 30°, the reflected light is found to be completely plane polarized Determine

Angle of refraction.

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149. Two polaroid's are oriented with their planes perpendicular to incident light and transmission axis making an angle of 30° with each other. What fraction of incident unpolarized light transmitted?

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150. Unpolarized light falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the final transmitted light is one - third the maximum intensity of the first transmitted beam

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151. Unpolarised light of intensity $32Wm^{-2}$ passes through three polarisers such that the transmission axis of the last polariser is crossed with first. If the intensity of the emerging light is $3Wm^{-2}$, the angle between the axes of the first two polarisers is

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152. Discuss the intensity of transmitted light when a polaroid sheet is rotated between two crossed polaroids?

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EXERCISE-IA (Theoretical questions :)

1. Transverse waves are possible in solids only because

A. they can sustain to compressive stress

B. they can sustain to longitudinal stress

C. they can sustain to shearing stress

D. they can yield to shearing stress.

Answer: C

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2. Longitudinal waves are possible in

A. they can sustain to compressive stress

B. they can sustain to longitudinal stress

C. they can sustain to shearing stress

D. they can yield to compressive stress

Answer: A

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3. Motion of a kink in a longitudinal spring produced by displacing one end of the spring sideways is an example to

A. Transverse

B. Longitudinal

C. both transverse and longitudinal

D. Rectilinear movement

Answer: C

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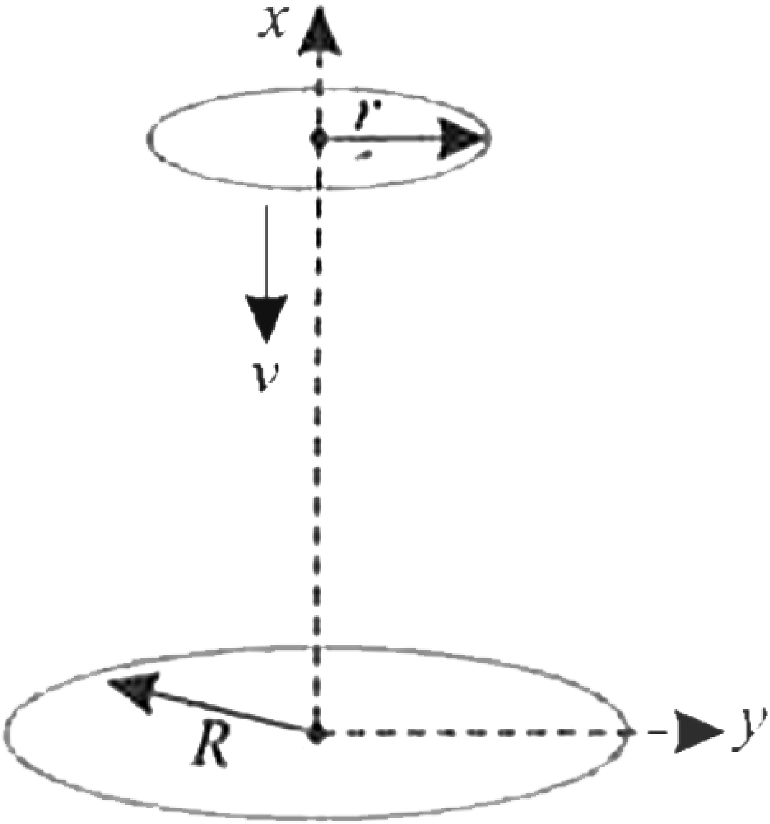
4. A ring of radius R is placed in the plane its centre at origin and its axis along the x-asis and having uniformly distributed positive charge. A ring of radius $r(< < R)$ and coaxial with the larger ring is moving along the axis with constant velcity , then the variation of electrical flux (ϕ) passing through the smaller ring with position will be best represent by :



A. Longitudinal

B. transverse

C. longitudinal and transverse

D. matter wave

Answer: A

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5. Water waves produced by a motorbot sailing in water are

A. Longitudinal

B. transverse

C. longitudinal and transverse

D. matter wave

Answer: C

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6. A system consists of n identical particles each of mass m. The total number of interaction potential energy terms possible are $\frac{n(n-1)}{x}$. Find value of x.

A. nature of developing restoring forces

B. Inertia

C. Both 1 & 2

D. None

Answer: C

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7. Mechanical waves are

A. A. longitudinal only

B. B. transverse only

C. C. can be both longitudinal or transverse

D. D. require no medium for propagation

Answer: C

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8. Which of the following properties of a wave is independent of others?

A. velocity

B. amplitude

C. frequency

D. wavelength

Answer: B

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9. The longitudinal waves in air differ from the electromagnetic waves in that they cannot be

A. A. reflected

B. B. refracted

C. C. diffracted

D. D. polarised

Answer: D

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10. Assertion: Sound wave is an example of longitudinal wave.

Reason : In longitudinal waves, the constituents of the medium oscillate perpendicular to the direction of wave propagation.

A. energy, momentum and mass

B. energy and momentum

C. energy and mass

D. energy

Answer: B

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11. A wave is reflected from a rigid support. The change in phase on reflection will be

A. π rad

B. 0^0

C. $\frac{\pi}{2}$ rad

D. 2π rad

Answer: A

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12. Which of the following statements is correct about the stationary waves

A. All the particles of the medium vibrate in the same phase

B. Particles at the consecutive antinodes differ in phase by π

C. Particles at the consecutive antinodes are in same phase

D. all the particles between consecutive nodes vibrate in phase

Answer: B

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13. There is no net transfer of energy by the particles of the medium in

A. longitudinal wave

B. transverse wave

C. progressive wave

D. stationary wave

Answer: D

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14. The wrong statement is

A. All the particles except at nodes vibrate with different amplitude but same frequency as that of component wave

B. The phase difference between the particles in the successive loops is it π

C. The phase difference between any two particles in same loop is zero

D. At nodes the strain is zero

Answer: D

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15. In stationary waves

A. energy is uniformly distributed

B. energy is maximum at nodes and minimum at antinodes

C. energy is minimum at nodes and maximum at antinodes

D. none of the above

Answer: C

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16. When ever stationary waves are set up, in any medium, then

A. condensations occur at nodes

B. refractions occur at antinodes

C. no strain is experienced at the nodes

D. no strain is experienced at the antinodes

Answer: D

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17. The waves in which the particles of the medium vibrate in a direction perpendicular to the direction of wave motion are known as

A. propagated waves

B. longitudinal waves

C. transverse waves

D. none of these

Answer: C

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18. The number of waves, contained in unit length of the medium, is called

A. wave pulse

B. wave number

C. elastic wave

D. electromagnetic wave

Answer: B

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19. For a wave propagating in medium, identify the property that is independent of the others.

A. velocity

B. wavelength

C. frequency

D. all these depend on each other

Answer: A

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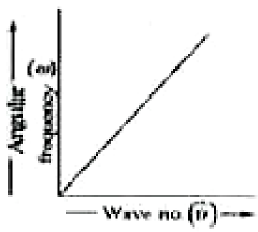
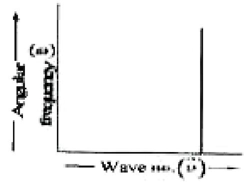
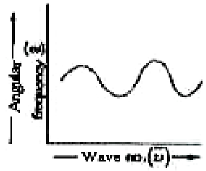
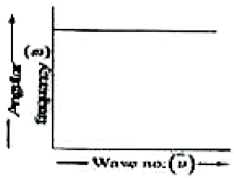
20. The graph between wave number $\left(\overrightarrow{v}\right)$ and angular frequency (ω) is

A. 

B. 

C. 

D. 

Answer: A

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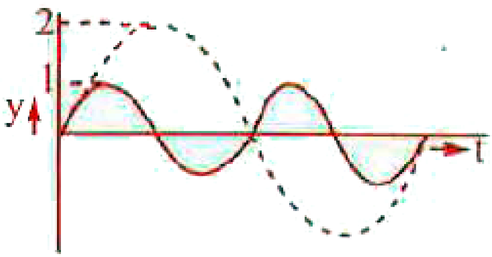
21. Dependence of disturbances due to two waves on time is shown in the figure. The ratio of their intensities I_1 / I_2

will be



A. $1:1$

B. $1:2$

C. $4:1$

D. $16:1$

Answer: A

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22. Which of the following equation reprsents a wave ?

A. $y = a \sin \omega t$

B. $y = a \cos kx$

C. $y = a \sin(\omega t - bx + c)$

D. $y = a \sin(\omega t - kx)$

Answer: D

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23. A pulse of a wavetrain travels along a stretched string and reaches the fixed end of the string. It will be reflected back with

A. A phase change of 180° with velocity reversed

B. The same phase as the incident pulse with no reversal of velocity

C. A phase change of 180° with no reversal of velocity

D. The same phase as the incident pulse but with velocity reversed

Answer: A

Watch Video Solution

24. In a standing wave, the phase difference between two points on either side of a node is

A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

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25. A sine wave is travelling in a medium. A particular partile has zero displacement at a certain instant. The particle closest to it having zero displacement is at a distance

A. $\lambda/4$

B. $\lambda/3$

C. $\lambda/2$

D. λ

Answer: C

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26. When ever stationary waves are set up, in any medium, then

A. energy is propagated at a rate double that of each component progressive wave

B. the energy transfer along the path is zero

C. there is no energy in the medium

D. the energy density is same at every position on the path

Answer: B

Watch Video Solution

27. In stationary waves, nodes are the points where there is

A. maximum pressure

B. minimum pressure

C. minimum pressure variation

D. maximum pressure variation

Answer: D

Watch Video Solution

28. In a stationary wave along a string the strain is

A. zero at nodes

B. maximum at nodes

C. minimum at nodes

D. constant every where

Answer: B

Watch Video Solution

Watch Video Solution

29. Standing waves can be produced.

A. on a string clamped at both the ends

B. on a string clamped at one end and free at the other

C. when incident wave gets reflected from a wall

D. All the above

Answer: D

Watch Video Solution

30. In a stationary wave, all the particles of the medium cross the mean position with

A. cross the mean position with different velocities at different instants

B. cross the mean position with different velocities at the same instant

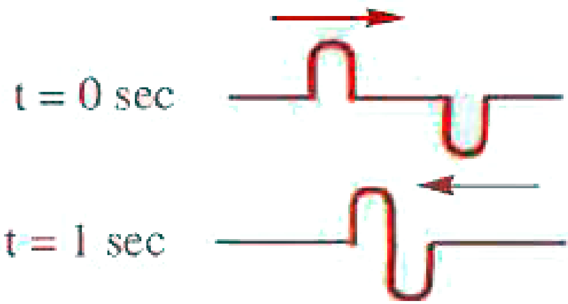
C. cross the mean position with same velocity

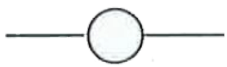
D. cross the mean position with same speed

Answer: B

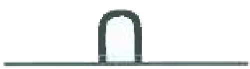
Watch Video Solution

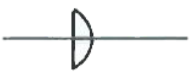
31. The given figures graphically depicts the two wave shapes at different times propagating in opposite directions. Guess the figure when they meet at a place.



A. 

B.

C. 

D. 

Answer: B

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32. A sonometer wire is vibrating in the second overtone. In the wire there are

A. two nodes and two antinodes

B. one node and two antinodes

C. four nodes and three antinodes

D. three nodes and three antinodes

Answer: C

Watch Video Solution

33. The types of waves produced in a sonometer wire are

A. transverse progressive

B. transverse stationary

C. longitudinal progressive

D. longitudinal stationary

Answer: B

Watch Video Solution

34. Two strings A and B made of same material are stretched by same tension. The radius of string A is double of the radius of B. A transverse wave travels on A with speed v_A and on B with speed v_B. The ratio $\frac{v_A}{v_B}$ is

A. $1/2$

B. 2

C. $1/4$

D. 4

Answer: A

Watch Video Solution

35. A second harmonic has to be generated in a string of length L stretched between two rigid supports. The point where the string has to be plucked and touched are

A. pluck at $\frac{l}{4}$ touch at $\frac{l}{2}$

B. pluck at $\frac{l}{4}$ touch at $\frac{3l}{4}$

C. pluck at $\frac{l}{2}$ touch at $\frac{l}{4}$

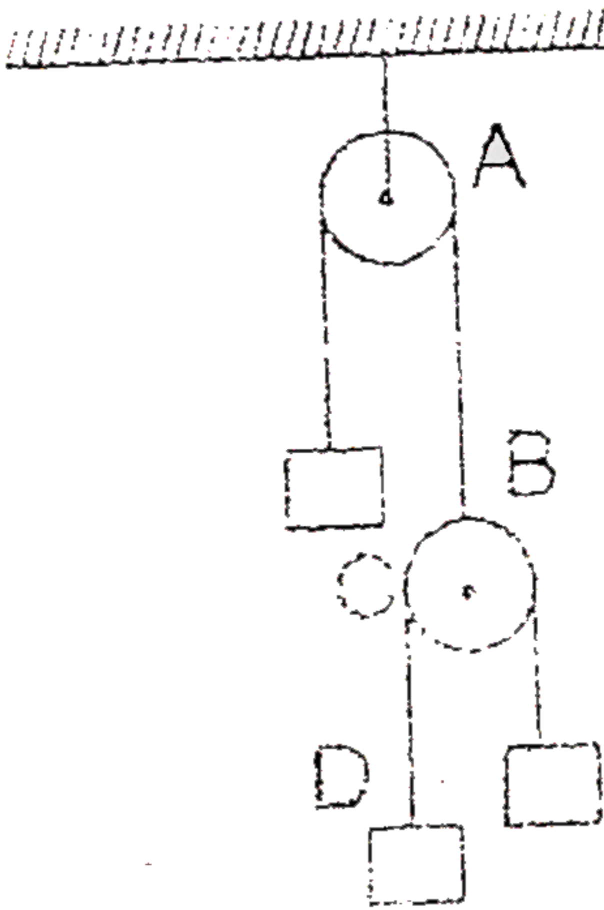
D. pluck at $\frac{l}{2}$ touch at $\frac{3l}{4}$

Answer: A

Watch Video Solution

36. Both the strings, shown in figure, are made of same material and have same cross-section. The pulleys are light. The wave speed of transverse wave in the string AB is v_1

and in CD it is v_2, the v_1 / v_2 is



A. 1

B. 2

C. $\sqrt{2}$

D. $1/\sqrt{2}$

Answer: D

Watch Video Solution

37. A wave pulse, travelling on a two piece string, gets partically reflected and partically transmitted at the junction, The reflected wave is inverted in shape as compard to the incident one. If the incident wave has speed v and the transmitted wave v'

A. $\lambda^{l} > \lambda$

B. $\lambda^{l} = \lambda$

C. $\lambda^{l} < \lambda$

D. Nothing can be said about the relation of λ and λ^{l}

Answer: C

Watch Video Solution

38. A heavy uniform rope is held vertically by clamping it to a rigid support at the upper end. A wave of a certain frequency is set up at the lower end. The wave will

A. travel with same velocity along the string

B. travel with decreasing velocity along the string

C. travel with increasing velocity along the string

D. travel with increasing frequency along the string

Answer: C

Watch Video Solution

39. If a stretched string is plucked at the centre

A. even harmonics are present

B. odd harmonics are absent

C. even harmonics are absent

D. all harmonics are present

Answer: C

Watch Video Solution

Watch Video Solution

40. A stone is hung from a sonometer wire. If the stone is immersed in water the fundamental frequency

A. increases

B. decreases

C. remains same

D. becomes erratic

Answer: B

Watch Video Solution

41. Two wires of equal length are stretched by the same force. One wire is heavy while the other is light which one will have less frequency

A. heavier wire

B. lighter wire

C. both have same frequency

D. data insufficient

Answer: A

Watch Video Solution

42. A stretched string is used in musical instruments because

A. It vibrates only under tension

B. It is rich in harmonics

C. Poor in overtones

D. Only even harmonics are present

Answer: B

Watch Video Solution

43. Two waves of same frequency and intensity superimpose on each other in opposite phases. After the superposition the intensity and frequency of waves will.

A. increases

B. decreases

C. Remain constant

D. Become zero

Answer: D

Watch Video Solution

44. A set of tones whose frequencies are integral multiples of the fundamental frequency are called

A. Overtones

B. harmonics

C. beat frequency

D. doppler's frequency

Answer: B

Watch Video Solution

45. Sound travels fastest in

A. steel

B. air

C. water

D. vaccum

Answer: A

Watch Video Solution

46. At the open end of organ pipe

A. 0

B. 3π

C. 2π

D. $\pi / 2$

Answer: A

Watch Video Solution

47. A bomb explodes on moon. How long does the sound take to reach the earth (average distance between the earth and moon $3.8 \times 10^8 m$)

A. A) $1.16 \times 10^6 s$

B. B) $1.16 \times 10^6 hr$

C. C) $10 s$

D. D) Sound is not transmitted to earth

Answer: D

Watch Video Solution

48. A transverse wave travels along the Z-axis. The particles of the medium must move

A. Along the Z-axis

B. Along the X-axis

C. Along the Y-axis

D. in the the X-Y plane

Answer: D

Watch Video Solution

49. A sound tone is produced under water. When it enters air

A. its frequency and wavelength increase

B. its frequency and wavelength decrease

C. Wave length decreases and frequency does not change

D. Wave length increases and frequency does not change

Answer: C

Watch Video Solution

50. The longitudinal wave velocity in solids in the form of a rod

A. does not depend on wave length and frequency

B. depends on young's modulus 'y' and density 'r'

C. is given by $\sqrt{\frac{y}{\rho}}$

D. All the above

Answer: D

Watch Video Solution

51. The longitudinal wave velocity in fluid

A. A) does not depend on wave length and frequency

B. B) depends on bulk modulus and density

C. C) is given by $\sqrt{\frac{B}{\rho}}$

D. D) All the above

Answer: D

Watch Video Solution

52. AIDS cannot be transmitted by

A. S- waves

B. transverse mechanical waves

C. electromagnetic waves

D. progressive waves

Answer: B

Watch Video Solution

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53. Speed of sound wave in a gas V_1 and rms speed of molecules of the gas at the same temperature is v_2.

A. $v_1 = v_2$

B. $v_1 < v_2$

C. $v_1 > v_2$

D. $v_1 \leq v_2$

Answer: B

Watch Video Solution

54. If v_a, v_h and v_m and are the speeds of sound in air, hydrogen and a metal at the same temperature, then

A. A) $v_h > v_a > v_m$

B. B) $v_m > v_h > v_a$

C. C) $v_h > v_m > v_a$

D. D) $v_a > v_h > v_m$

Answer: B

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55. The velocity of sound is generally greater in solids than in gases because

A. the density of solids is high and the elasticity is low

B. both the density and the elasticity of solids are very low

C. the density of solids is low and the elasticity is high

D. the elasticity of solids is very high

Answer: D

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56. If v_m is the velocity of sound in moist air and v_d is the velocity of sound in dry air then

A. $V_m > V_d$

B. $V_m < V_d$

C. $V_m = V_d$

D. $V_d > \; > V_m$

Answer: A

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57. A tuning fork sends sound waves in air. If the temperature of the air increases, which of the following parameters will changes?

A. Displacement amplitude

B. Frequency

C. velocity

D. Time period

Answer: C

Watch Video Solution

58. Speed of sound in a gas at constant temperature depends on

A. Pressure

B. Density

C. Both 1 & 2

D. Nature or the gas

Answer: D

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59. the velocity of sound in any gas deponds upon

A. Wavelength of sound

B. Density and elasticity of gas

C. Intensity of sound waves

D. Amplitude and frequency of sound

Answer: B

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60. the velocity of sound in any gas deponds upon

A. Transverse

B. Longitudinal

C. Both 1 & 2

D. None

Answer: C

Watch Video Solution

61. The type of waves that can be propagated through solid is

A. Longitudinal

B. Transverse

C. Both longitudinal & transverse

D. neither longitudinal & transerve

Answer: D

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62. An open organ pipe of length l vibrates in its fundamental mode. The pressure variation is maximum

A. at the two ends

B. at the middle of the pipe

C. at distances L/4 inside the ends

D. at distances L/8 inside the ends

Answer: B

Watch Video Solution

63. A stationary wave is set up in a resonance air column of a glass tube partially filled with water by holding a tuning fork near the open end, the open end of the tube is :

A. Always a node

B. Always an antinode

C. Sometimes a node and sometimes an antinode

D. Neither a node nor an antinode

Answer: B

Watch Video Solution

64. An open pipe produces fundamental note. All of a sudden one of its ends is closed. If again fundamental note is emitted, the frequency of the note will be :

A. Double

B. Half

C. Same

D. None of these

Answer: B

Watch Video Solution

65. The first overtone of an open pipe has frequency n. The first ovetone of a closed pipe of the same length will have frequency

A. Same as the fundamental frequency of an open tube of same length

B. Twice the fundamental frequency of an open tube of same length

C. Same as that of the first overtone of an open tube of same length

D. None of the above

Answer: D

Watch Video Solution

66. If the temperature increases, then what happens to the frequency of air column produced by the organ pipe

A. increases

B. decreases

C. Unchanged

D. Change erratically

Answer: A

Watch Video Solution

67. A closed organ pipe and an open organ pie of same length produce four bets in their fundamental mode when sounded together, If length of the open organ pipe is increased, then the number of beats will

A. remains the same

B. increases

C. decreases

D. firt (4) then (1)

Answer: B

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68. A closed organ pipe (closed a one end) is excited to support the third overtone. It is found that air in the pipe has

A. Three nodes and three antinodes

B. Three nodes and four antinodes

C. four nodes and three antinodes

D. Four nodes and four antinodes

Answer: D

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69. If we study the vibration of a pipe open at both ends, which of the following statements is not true?

A. Open end will be antinode

B. Odd harmonics of the fundamental frequency will be generated

C. All harmonics of the fundamental frequency will be generated

D. ressure change will be maximum at both ends

Answer: D

Watch Video Solution

70. The presence of dangerous gases in mines can be detected using the phenomenon of

A. echo

B. doppler effect

C. beats

D. resonance

Answer: C

Watch Video Solution

71. If n_1 and n_2 are the frequencies of sound waves producing beats then the time interval between one maxima and next minima is

A. $\dfrac{1}{n_1+n_2}$

B. $\dfrac{1}{n_1-n_2}$

C. $\dfrac{1}{2(n_1+n_2)}$

D. $\dfrac{1}{2(n_1-n_2)}$

Answer: D

Watch Video Solution

72. When the stem of a vibrating tuning fork is gently pressed on the surface of a table louder sound is heard. Why?

A. increases

B. decreases

C. remains same

D. become erratic

Answer: A

Watch Video Solution

73. The amplitude of a vibrating particle during beats depends on

A. time

B. its location

C. both 1 and 2

D. neither 1 nor 2

Answer: A

Watch Video Solution

74. The amplitude of a vibrating particle during beats depends on

A. not transported

B. transported

C. some times transported and sometimes not

D. not transported if the amplitudes of the parent waves are equal

Answer: B

Watch Video Solution

75. When beats are produced by two progressive waves of nearly the same frequency , which one of the following is correct ?

A. The particle vibrates simple harmonically, with the frequency equal to the difference in the component frequencies

B. The amplitude of vibrations at any point change simple harmonically with a frequency proportional to the difference in the frequency of the two waves

C. The frequency of a beat changes as the time progresses

D. all the above

Answer: B

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76. For production of beats the two souces must have

A. Different frequencies and same amplitude

B. Differnet frequencies

C. Differnet frequencies, same amplitude and same phase

D. Different frequencies and same phase

Answer: B

Watch Video Solution

77. In Dopplers effect, when a source moves towards a stationary observer, the apparent increase in frequency is due to

A. increase in wave length of sound received by observer

B. decrease in wave length of sound received by observer

C. increase in number of waves received by observer in one second

D. none of the above, but due to something else

Answer: B

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78. Doppler shift in frequency does not depend upon

A. the actual frequency of the wave

B. the distance of the source from the listener

C. the velocity of the source

D. the velocity of the observer

Answer: B

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79. Doppler effect is applicable to

A. sound waves

B. light waves

C. radio waves

D. all the above

Answer: D

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80. Which of the following is correct

A. Doppler effect in sound and light is asymmetric

B. Doppler effect in sound and light is symmetric

C. Doppler effect in sound is asymmetric and in light it is symmetric

D. none

Answer: C

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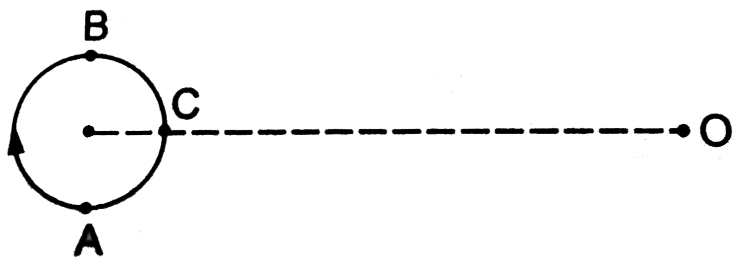
81. A small source of sound moves on a circle as shown in figure and an observer is sitting at O. Let v_1, v_2, v_3 be the frequencies heard when the source is at A,B and C respectively.



A. $v_1 > v_2 > v_3$

B. $v_1 = v_2 > v_3$

C. $v_2 > v_3 > v_1$

D. $v_1 > v_3 > v_2$

Answer: C

Watch Video Solution

82. A radar sends waves towards a distant object and receives the signla reflected by the object. These waves are

A. decrease

B. increases

C. remains same

D. may increases or decrease

Answer: A

Watch Video Solution

83. Working of rocket is based on

A. Beats

B. Doppler effect

C. Stationary waves

D. Reverberation

Answer: B

Watch Video Solution

84. A violen note and sitar note may have the same frequency, yet we can distinguish between the two notes basing on the

A. pitch

B. loudness

C. number of overtones or quality

D. All the above

Answer: C

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85. When two waves of nearly equal frequencies superimpose them. The frequency of combined wave is $'f_1'$ that of the amplitude is $'f_2'$ and the beat frequency is $'f_3'$ Arrange them in increasing order of frequency

A. $f_1 < f_2 < f_3$

B. $f_3 < f_2 < f_1$

C. $f_2 < f_3 < f_1$

D. $f_1 < f_3 < f_2$

Answer: C

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EXERCISE-IA (Statement type questions:)

1. Statement(A) : Elasticity property is necessary for the propagation of sound

Statement(B) : In a stationary wave, the rate of transfer of energy across any section is zero

A. A is true, B is false

B. A is false, B is true

C. Both A and B are true

D. Both A and B are false

Answer: C

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2. The intensity of a wave is

(a) Proportional to square of the frequency

(b) Proportional to the velocity of wave

(c) Proportional to the density of the medium

(d) Proportional to the square of the distance of the source from the observer

A. only d is true

B. a & b are true

C. a,b, & c are true

D. a,b,c & d are true

Answer: C

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Watch Video Solution

3. Which of the following functions represent stationary wave. Where a,b,c are constants

(a) $y = a\cos(bx)\sin(ct)$ (b) $y = a\sin(bx)\cos(ct)$

(c) $y = a\sin(bx + ct)$

(d) $y = a\sin(bx + ct) + a\sin(bx - ct)$

A. a & b

B. a,b & c

C. b,c & d

D. a,b, & d

Answer: D

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Watch Video Solution

4. A steel wire of length $1m$ and density $8000kg/m^3$ is stretched tightly between two rigid supports . When vibrating in its fundamental mode , its frequency is $200Hz$.

a. What is the velocity of transverse wave along this wire ?

b. What is the longitudinal stress in the wire ?

c. If the maximum acceleration of the wire is $880m/s^2$, what is the amplitude of vibration at the midpoint ?

A. A & B are true

B. A is true but B is false

C. A is false but B is true

D. A & B are false

Answer: A

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5. During the apparent change in frequency due to relative motion of source of sound and observer

(a) The frequency changes due to the motion of observer

(b)The wavelenght changes due to the motion of the source

(c) The apparent frequency is independent of velocity of medium

A. a & b true

B. b & c true

C. a & c true

D. a,b & c true

Answer: A

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6. The apparent frequency and real frequency of sound are the same

(A) If source of sound and observer are moving in the same direction with same speed

(B) If source of sound and observer are moving in the opposite direction with the same speed

A. A is true, B is false

B. A is false B is true

C. Both A & B are true

D. Both A & B are false

Answer: A

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7. Statement(A): The reflection of sound from an extended object is echo

Statement(B): The super position of waves of same frequency is beats

Statement(C): The apparent change in frequency of source of sound due to relative motion between source and observer is Doppler effect

Statement(D): The super position of wave of slightly differ in frequency is stationary waves

A. A, B, C, D are true

B. only A, D, B are true

C. only A & C are true

D. only B, C are true

Answer: C

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8. (A) Source motion effects the wavelength but observer motion effects the number of waves received by him

(B) The apparent change in frequency depends on the distance between source and observer

(C) The echo and the direct note differ both in speed and intensity

The correct statements are

A. Only A

B. B,C only

C. A,B, C

D. A,C only

Answer: A

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9. (A) The rotation of Saturn's rings and of double stars has been detected using the phenomenon of beats.

(B) Megaphone and ear trumpet work on the principle of interference of sound.

A. Both A and B are true

B. Both A and B are false

C. A is true, B is false

D. A is false, B is true

Answer: B

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10. Velocity of sound in air

(I) increases with temperature

(II) decreases with temperature

(III) increase with pressure

(IV) is independent of pressure

(V) decreases with pressure

(VI) is independent of temperature Choose the correct answer

A. only I and II are true

B. only I and III are true

C. only II and III are true

D. only I and IV are true

Answer: D

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11. If is desired to increase the fundamental resonance frequency in a tube which is closed at one end. This can be achieved by

A. A,C,D are true

B. A is onlu true

C. C is only true

D. D is only true

Answer: A

Watch Video Solution

12. (A): In solids mechanical waves can be either transverse or longitudinal depending on mode of excitation.

(B) : Waves on strings are always transverse.

A. Both A and B are true

B. Both A and B are false

C. A is true, B is false

D. A is false, B is true

Answer: C

Watch Video Solution

13. (A): Mechanical transverse waves can propagate only in medium with shear modulus of elasticity

(B) : Longitudinal waves need bulk modulus of elasticity and are therefore possible in all media, solids, liquids and gases

A. Both A and B are true

B. Both A and B are false

C. A is true, B is false

D. A is false, B is true

Answer: A

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14. (A): In a harmonic progressive wave of a given frequency all particles have the same amplitude but different phases at a given instant of time.

(B) : In a stationary wave, all particles between two nodes have the same phase at a given instant but have different amplitudes.

A. Both A and B are true

B. Both A and B are false

C. A is true, B is false

D. A is false, B is true

Answer: A

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15. (A) : Relative to an observer at rest in a medium the speed of a mechanical wave in that medium (1) depends only on elastic and other properties (such as mass density) of the medium. It does not depend on the velocity of the source.

(B): For an observer moving with velocity v_0 relative to the medium, the speed of a wave is obviously different from v and is given by $v \pm v_0$

A. Both A and B are true

B. Both A and B are false

C. A is true, B is false

D. A is false, B is true

Answer: A

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16. (A): According to Laplace the propagation of sound in air is an adiabatic process.

(B): Pressure has no effect on velocity of sound in a gas as long as temperature remains constant.

(C): The velocity of sound in air changes by 0.61 m/s when temperature changes by $1^\circ C$

A. All are true

B. A,B are only true

C. B are true

D. A,C are only true

Answer: A

Watch Video Solution

17. (A): A person hears maximum sound at displacement anti node (or) pressure node.

(B) : Two organ pipes of same length open at both ends produce sound of different pitch if their radii are different.

(C): If oil of density higher than water is filled in place of water in a resonance tube, its frequency remain unchanged.

A. All are true

B. A,B are only true

C. B are true

D. A,C are only true

Answer: A

Watch Video Solution

18. A listener is at rest with respect to the source of sound. A wind starts blowing along the line joining the source and the observer. Which of the following quantities do not change?

A. Only a,d

B. Only a,b

C. Only b,c

D. Only c,d

Answer: A

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EXERCISE-IA (Matching)

1. Match the following

List - 1	List -2
a) Longitudinal waves are propagated	e) Interference with time
b) Transverse waves are propagated	f) Property of all states of matter
c) Stationary waves are	g) Property of solids produced
d) Beats is the result of	h) Interference in space
	i) Properly of fluids

A. $a-g, b-h, c-I, d-f$

B. $a-f, b-g, c-h, d-e$

C. $a-f, b-I, c-e, d-g$

D. $a-h, b-g, c-Id-f$

Answer: B

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2. Match the following

List - 1	List - 2
a) Resultant amplitude varies with a frequency	e) $\frac{1}{n_1 - n_2}$
b) Resultant wave frequency	f) $\left(\frac{n_1 - n_2}{2}\right)$
c) Time interval between two - successive maxima of resultant wave	g) $\frac{1}{2(n_1 - n_2)}$
d) Time internal between maxima and minima of the resultant wave	h) $\left(\frac{n_1 + n_2}{2}\right)$
	i) $\frac{2}{n_1 - n_2}$

A. $a - h, b - f, c - g, d - e$

B. $a - f, b - e, c - h, d - g$

C. $a-f, b-h, c-e, d-g$

D. $a-h, b-e, c-f, d-i$

Answer: C

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3. Match the following

List - 1	List - 2
a) Electromagnetic waves	e) Velocity of sound
b) longitudinal waves	f) Symmetric
c) Doppler effect in sound	g) Donot exhibit polarisation
d) Doppler effect in light	h) Asymmetric
	i) Exhibit polarisation

A. $a - e, b - g, c - h, d - i$

B. $a - f, b - I, c - e, d - f$

C. $a - h, b - g, c - f, d - e$

D. $a - I, b - g, c - h, d - f$

Answer: D

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4. Match the following

List - 1	List - 2
a) Doppler effect	d) Velocity of stars
b) Beats	e) Loudness of sound
c) Echo	f) Standardisation of frequency
	g) Deapth of the oceans

A. $a-g, b-d, c-i$

B. $a-I, b-d, c-g$

C. $a-g, b-e, c-f$

D. $a-d, b-f, c-g$

Answer: D

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EXERCISE-IB (Assertion (A) & Reason (R) Type Questions)

1. (A): In a mechanical progressive wave, energy is transferred from one point to the other.

(R): In a mechanical progressive wave energy transfer takes place because of the coupling through elastic forces between neighbouring oscillating particles of the medium.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

2. (A) In a progressive wave, the phase diffe rence between two particles of a medium having a path difference λ is 2π

(R): The phase difference is directly propor tional to path difference between particles in progressive wave

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

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3. (A) : Transverse waves are not produced in liquids and gases.

(R): Light waves are transverse waves.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

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4. "Ocean waves hitting a beach are always found to be nearly normal to the shore." Why?

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

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5. (A): Compression and rarefaction involve changes in pressure.

(R): When particles are compressed, density of medium increases and when they are rarefied, density of medium decreases

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

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6. (A): Mechanical waves cannot be polarised.

(R): Electromagnetic waves cannot be polarised.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

7. (A) : Waves produced by a motor boat sailing in water are both longitudinal and transverse waves.

(R): The longitudinal and transverse waves cannot be produced simultaneously.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

8. (A): The longitudinal waves are called pressure waves.

(R): Propagation of longitudinal waves through a medium involves changes in pressure and volume of medium, when compression and rarefaction are formed.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

9. (A): Transverse mechanical waves can not propagates in liquids and gases.

(R): Liquids and gases flow when acted on by shearing stress, they can not sustain shear stress

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

10. (A): Transverse mechanical waves can not propagates in liquids and gases.

(R): Liquids and gases flow when acted on by shearing stress, they can not sustain shear stress

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

11. (A): Solids can support both longitudinal and transverse waves but only mechanical longitudinal waves can propagate in gases.

(R): For the propagation of mechanical transverse waves, medium must also necessarily have the property of rigidity.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

12. Assertion : The frequencies of incident, reflected and refracted beam of monochromatic light at the interface of two media are same.

Reason : The incident, reflected and refracted rays are coplanar.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

13. (A): Only longitudinal waves can propagate through a gas.

(R): Gases have only bulk modulus.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

14. (A): A medium must have elasticity to support wave motion.

(R): Restoring force responsible for wave motion results due to elasticity of the medium.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

15. (A): Both transverse and longitudinal mechanical waves can travel through solids, whereas only longitudinal mechanical waves can travel through gases.

(R): Gases do not have rigidity modulus.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

16. Statement-1 : Mechanical transverse waves cannot be generated in gaseous medium

Statement-2 : Mechanical transverse waves can be produced only in such medium which have shearing property.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

17. (A): In a progressive wave particle velocity and wave velocity are same.

(R): In a stationary wave energy is not confined to a limited region only.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

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18. (A): Wave velocity and particle velocity for transverse wave are mutually perpendi cular to each other.

(R): The wave velocity and particle velocity have a constant ratio of their magnitudes

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

19. (A): If in the presence of two independent audio signals, no beats are heard, it need not imply that they are of same frequency.

(R): If the frequency difference is more than 10 Hz no beats are heared.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

20. (A): When a wave goes from one medium to other, average power transmitted by the wave may change.

(R): Due to a change in the medium, amplitude, speed, wavelength and frequency of the wave may change. A) Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'. B) Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A' C) A' is true and 'R' is false D Both 'A' and 'R' are false

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

21. (A): If two waves of same amplitude, produce a resultant wave of same amplitude, then the phase difference between them will be 120°

(R): The resultant amplitude of two waves is equal to sum of amplitude of two waves

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

22. Assertion : On reflection from a rigid boundary there takes place a complete reversal of phase.

Reason : On reflection from a denser medium, both the particle velocity and wave velocity are reversed in sign.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

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23. (A) : The wave length of sound waves increases when they are refracted from air into water

(R): Velocity of sound is greater in water than in air

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

24. Statement I:In a progressive logitudinal wave, the amplitude of the wave will not be the same at all points of the medium along the direction of motion of the wave.

Statement II: there is a continuous change of the phase angle of the wave as it progressive in the direction of motion.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

25. (A): Two sound waves of frequencies 400 Hz and 200 Hz can propagate with the same velocity through a given medium

(R): The velocity of sound is independent of frequency

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

26. Statement 1: Sound waves can not propagate through vacuum but light waves can.

Statement 2: Sound wave can not be polarised but light waves can be.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

27. (A): The velocity of sound changes as we go up in the atmosphere.

(R): Pressure decreases as we go up in the atmosphere.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

28. Assertion : The flash of lightening is seen before the sound of thunder is heard .

Reason : Speed of sound is greater than speed of light .

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

29. (A): A wind is different from the sound wave in air.

(R): The wind involves motion of air from one place to the other. The sound wave involves compressions and rarefactions of layers of air.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

30. (A): The velocity of sound in hydrogen gas is more than the velocity of sound in oxygen gas.

(R): The density of hydrogen is more than the density of oxygen.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

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31. Assertion : Sound would travel faster on a not summer day than on a cold winter day,

Reason : Velocity of sound is directly proportional to the square root of its aboslute temperature.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

32. (A): The error in Newton's formula of velocity of sound in air was 16%.

(R): The experimental value of velocity of sound in air at $0^\circ C$ is 331m/s

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

33. Assertion : The basic of Laplace correction was that, exchange of heat between the region of compression and rarefaction in air is not possible.

Reason : Air is a bad conductor of heat and velocity of sound in air is large

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

34. (A): Under given conditions of pressure and temperature, sound travels faster in a monoatomic gas than in diatomic gas.

(R): Opposition for wave to travel is more in diatomic gas than monoatomic gas.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

35. Assertion: The speed of sound in solids is maximum though their density is large.

Reason The coefficient of elasticity of solids is large.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

36. Statement-1 : Sound travels faster in moist air

Statement-2 : The density of moist air is less then density of dry air.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

37. (A): Sound produced by an open organ pipe is richer than the sound produced by a closed organ pipe.

(R): Outside air can enter the pipe from both ends, in case of open organ pipe.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

38. "The bells are made of metals and not of wood." Why?

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

39. Statement-1 : Infrasonic waves are generally produced by large vibrating bodies

Statement-2 : Infrasonic waves have frequency range lies below 20 Hz

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

Watch Video Solution

40. (A): Speed of sound in a gas is independent of changes in pressure of the medium at a given temperature.

(R): A change in pressure of a gas is always accompanied by a change in density so that their ratio is always constant at a given temperature.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

41. Assertion (A) : Radio waves can be polarised.

Reason (R) : Sound waves are longitudinal waves.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

42. Assertion: In adiabatic expansion, temperature of gas always decreases.

Reason: In adiabatic process exchange of heat is zero.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

43. Sound waves in air cannot be polarized because

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

44. (A): A tuning fork is made of an alloy of steel, nickel and chromium.

(R): The alloy of steel, nickel and chromium is called Elinvar

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

45. (A): Two arms of a tuning fork vibrate in same phase.

(R): Each arm has a different frequency of vibration.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

Watch Video Solution

46. (A): All the particles between two consecutive nodes vibrate in the same phase.

(R): Particles on two sides of a node vibrate mutually in opposite phase

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

47. Assertion: In a stationary wave, there is no transfer of energy.

Reason: There is not outward motion of the disturbance from one particle to adjoining particle in a stationary wave.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

48. (A): For the formation of stationary waves the medium must be bounded (having definite boundaries).

(R): In the stationary wave, some particles of the medium remain permanently at rest.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

49. Statement-1 : In the case of a stationary wave, a person hear a loud sound at the nodes as compared to the antinodes

Statement-2 : In a stationary wave all the particles of the medium vibrate in phase.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

50. (A): Velocity of particles, while crossing mean position (in stationary waves) varies from maximum at antinodes to zero at nodes.

(R): Amplitude of vibration at antinodes is maximum and at nodes, the amplitude is zero. And all particles between two successive nodes cross the mean position together.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

51. (A): In a longitudinal stationary wave a displacement node coincides with a pressure anti node.

(R): Restoring force is maximum at node and minimum at anti node.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

52. A tuning fork producing sound will stop producing sound when you touch it.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

53. (A): When a stretched string vibrates in two segments, then all the vibrating particles in first half of the string are in out of phase to that of in the remaining of the string

(R): In a stationary wave the phase difference between the vibrating particles in two consecutive loops is trad.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

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54. A violen note and sitar note may have the same frequency, yet we can distinguish between the two notes basing on the

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

55. A): An open organ pipe of certain length have the same fundamental frequency as closed organ pipe of half the length.

(R): In the case of open organ pipe, at both the ends antinodes are formed, while in the closed organ pipe at one end antinode and at the other end node is formed.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

56. (A): The maximum number of beats that the human ear can detect is "10"

(R): The time of persistence of hearing is '0.1' sec.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

57. (A): Violet shift indicates that a star is approaching the earth.

(R): Violet shift indicates decrease in apparent wavelength of light.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

58. A : Doppler's effect in sound is asymmetric but in light , it is symmetric

R : In Sound , change in frequency depends on the individual velocity of both the source as well as the observer . In light , change in frequency depends on the relative velocity between source and observer .

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

59. A : In Doppler's effect the value of apparent frequency depends on the relative motion between source and observer .

R : The change in frequency in Doppler effect is independent from the distance between source and observer .

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

60. Statement(A): The reflection of sound from an extended object is echo

Statement(B): The super position of waves of same frequency is beats

Statement(C): The apparent change in frequency of source of sound due to relative motion between source and observer is Doppler effect

Statement(D): The super position of wave of slightly differ in frequency is stationary waves

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

61. (A): Doppler effect for light is important in astronomy.

(R): Doppler effect of light help in viewing stars.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

62. (A): Doppler effect is not applicable for a supersonic source of sound.

(R): Supersonic source produces a shock wave.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

63. (A): When an observer moves towards a stationary source, the frequency of sound heard is greater than the actual frequency

(R) : Apparent frequency increases because the observer intercepts more number of waves when he moves towards the source.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

64. (A) : When a source moves towards a stationary observer, the speed of source relative to the observer remains unchanged.

(R): The apparent change in frequency is due to change in the wavelength brought by the motion of the source.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

65. A : Intensity of sound wave does not change when the listener moves towards or away from the stationary source .

R : The motion of listener towards a stationary source causes an apparent change in wavelength of sound .

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: B

Watch Video Solution

66. (A): When an observer in motion 'passes by a stationary source the apparent frequency heard first continuously increases and then continously decreases.

(R) : Apparent change in wavelength is not responsible for the change in frequency.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

67. (A): Apparent frequency is equal to actual frequency when there is no relative motion between source and observer.

(R): When there is no relative motion between the source and observer the velocity of sound is zero

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

68. (A): If wave enters from one medium to another medium then sum of amplitudes of reflected wave and transmitted wave is equal to the amplitude of incident wave.

(R): If wave enters from one medium to another medium energy is transmitted only.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: C

Watch Video Solution

69. (A): When a sound source moves towards observer, then frequency of sound increases.

(R): Wavelength of sound in medium towards observer is decreased.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

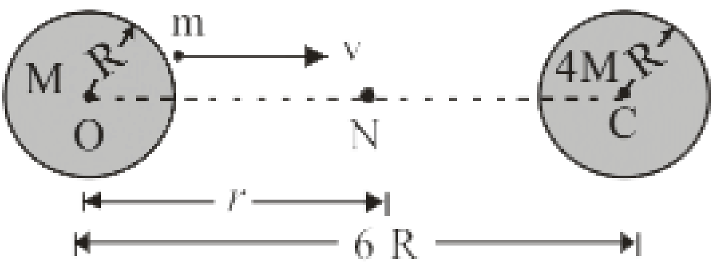
D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

Watch Video Solution

70. Two uniform solid spheres of equal radii R, but mass M and 4 M have a centre to centre separation 6 R, as shown in figure. The two spheres are held fixed. A projectile of mass m is projected from the surface of the sphere of mass M directly towards the centre of the second sphere. Obtain an expression for the minimum speed v of the projectile so that it reaches the surface of the second sphere.



A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: A

Watch Video Solution

71. Statement I: In a small segament of string caruing sinusoidal wave, total energy is conserved.

Statement II: Every small part moves in SHM and in SHM total energy is conserved.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

Watch Video Solution

72. Statement I: two waves moving in a uniform string having uniform tension cannot have different velocities. Elastic and inertial properties of string are same for all waves in same string. Moreover speed of wave in a string depends on its elastic and inertial properties only.

A. Both 'A' and 'R' are true and 'R' is the correct, explanation of 'A'.

B. Both 'A' and 'R' are true and 'R' is not the correct explanation of 'A'

C. A' is true and 'R' is false

D. Both 'A' and 'R' are false

Answer: D

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EXERCISE-II (Wave Equations & Basics :)

1. Which of the following expressions is that of a simpleharmonic progressive wave ?

A. $y = A \sin wt$

B. $y = a \sin wt \cos kx$

C. $y = A \sin(wt - kx)$

D. $y = A \cos kx$

Answer: C

Watch Video Solution

2. The displacement y of a particle in a medium can be expressed as $y = -6\sin\left(100t + 20x + \frac{\pi}{4}\right)m$ where t is in seconds and x in metres. The speed of the wave is:

A. $2000ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. $5\pi ms^{-1}$

Answer: B

Watch Video Solution

3. The equation of a transverse wave travelling on a rope given by $y = 10 \sin \pi (0.01x - 2.00t)$ whrer y and x are in cm and t in second .This maximum traverse speed of a particle in the rope is about

A. $62.8 cm / s$

B. $75 cm / s$

C. $100 cm / s$

D. $121 cm / s$

Answer: A

Watch Video Solution

4. The angular frequency of a particle in a progressive wave in an elastic medium is $100\pi rads^{-1}$ and it is moving with a velocity of $200ms^{-1}$ The phase difference between two particles seperated by a distance of 20m is

A. 31.4 rad

B. π rad

C. $\frac{3\pi}{4}$ rad

D. 36 rad

Answer: A

Watch Video Solution

5. A progressive wave moves with a velocity of 36m/s in a medium with a frequency of 200Hz. The phase difference between two particles seperated by a distance of 1cm is

A. 40°

B. 20 rad

C. $\frac{\pi}{9}$ rad

D. $\frac{\pi^0}{9}$

Answer: C

Watch Video Solution

6. A progressive wave of frequency 500 Hz is travelling with a speed of 350 m/s. A compressional maximum appears at a place at a given instant. The minimum time interval after which of refraction maximum occurs at the same place is

A. $\frac{1}{250}s$

B. $\frac{1}{500}s$

C. $\frac{1}{1000}s$

D. $\frac{1}{350}s$

Answer: C

Watch Video Solution

7. The speed of a wave in a medium is 760 m/s. If 3600 waves are passing through a point in the medium in 2 min, then their wavelength is

A. $13.9m$

B. $25.3m$

C. $41.5m$

D. $57.2m$

Answer: B

Watch Video Solution

8. A wire of $9.8 \times 10^{-3} k\frac{g}{m}$ passes over a frictionless light pulley fixed on the top of a frictionless inclined plane which makes an angle of 30° with the horizontal. Masses m and M are tied at the two ends of wire such that m rests on the plane and M hangs freely vertically downwards. the entire system is in equilibrium and a transverse wave propagates along the wire with a velocities of $100m/s$.

A. m=20 kg

B. m=5 kg

C. m=2 kg

D. m=7 kg

Answer: A

Watch Video Solution

9. A uniform rope of mass of 0.1 kg and length 2.45 m hangs from the ceiling. The time taken by a transverse wave to travel the full length of rope is n sec. Then n

A. $0.5s$

B. $1.6s$

C. $1.2s$

D. $1.0s$

Answer: D

Watch Video Solution

10. A wave travelling along the x-axis is described by the equation $y(x, t) = 0.005 \cos(\alpha t - \beta t)$. If the wavelength and the time period of the wave in $0.08m$ and $2.0s$ respectively then α and β in appropriate units are

A. $\alpha = 25.00\pi, \beta = \pi$

B. $\alpha = \frac{0.08}{\pi}, \frac{2.0}{\pi}$

C. $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$

D. $\alpha = 12.50\pi, \beta = \frac{\pi}{2.0}$

Answer: A

Watch Video Solution

11. When 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. $\frac{\lambda}{4\pi}$

Answer: C

Watch Video Solution

12. A wave of length 2m is superposed on its reflected wave to form a stationary wave. A node is located at x = 3m. The next node will be located at x=

A. $3.25m$

B. $3.50m$

C. $3.75m$

D. 4 m

Answer: D

Watch Video Solution

13. The equation of a stationary wave is $y = 0.8\cos\left(\frac{\pi x}{20}\right)\sin 200\pi t$ where x is in cm and t is in s. The separation between consecutive nodes will be

A. 10 cm

B. 20 cm

C. 30 cm

D. 40 cm

Answer: B

Watch Video Solution

14. The vibrations of a string fixed at both ends are represented by $y = 16\sin\left(\pi\frac{x}{15}\right)\cos 96\pi t$ where x and y are in cm and t in seconds. Then the phase difference between the points at x = 13 cm and X = 16 cm in radian is

A. $\pi / 5$

B. π rad

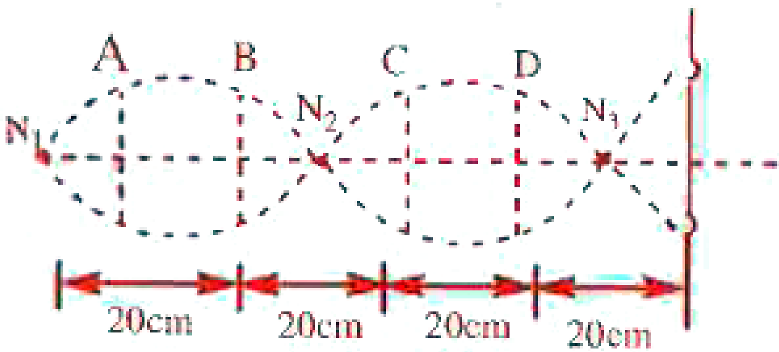
C. 0

D. $2\pi / 5$

Answer: B

Watch Video Solution

15. A stretched string of length 200cm supports a stationary wave with points having a displacement amplitude of mm being separated by equal intervals of 20cm. To which overtone do these vibrations belong.



A. 5

B. 4

C. 6

D. 3

Answer: B

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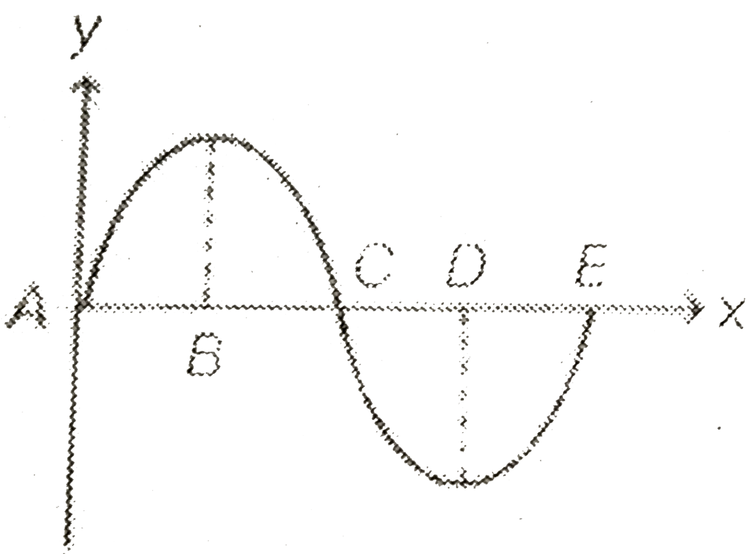
16. Sound wave is travellimg along positive x -direction . Displacement (y) of particles from their mean position at position x is a shown in figure . Choose the correct alternative(s).



A. Particle located at E has its velocity in negative y-direction

B. Particle located at D has zero velocity

C. change in pressure at D is zero

D. All the above

Answer: B

Watch Video Solution

17. the wave described bt

$Y = 0.25 \sin(10\pi \times \; - 2 \times t)$

where , x and y are in metre and t in second, is a wave travelling along the

A. ve x direction with frequency 1 Hz

B. $+ve$ x direction with frequency πHz and wavelength $\lambda = 0.2m$

C. $+ve$ x direction with frequency 1 Hz and wavelength $\lambda = 0.2m$

D. $-ve$ x direction with amplitude 0.25 m and wavelength $\lambda = 0.2m$

Answer: D

Watch Video Solution

18. A wave travelling in the positive x-direction having displacement along y-direaction as ,

1m wavelength 2πm and frequency of $\frac{1}{\pi}$

A. $y = \sin(x - 2t)$

B. $y = \sin(2\pi x - 2\pi t)$

C. $y = \sin(10\pi x - 10\pi t)$

D. $y = \sin(2\pi x + 2\pi t)$

Answer: C

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19. A wave travelling along positive x-axis is given by $y = A\sin(\omega t - kx)$. If it is reflected from rigid boundary such that 80% amplitude is reflected, then equation of reflected wave is

A. $y = A\sin(\omega t + kx)$

B. $y = -0.8A\sin(\omega t + kx)$

C. $y = A\sin 0.8A(\omega t + 0.8kx)$

D. $y = A\sin(\omega t + 0.8kx)$

Answer: A

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EXERCISE-II (Strings (Speed of a travelling wave:))

1. The length of a string attached to two rigid supports is 40 cm. The maximum wavelength in cm of a stationary wave produced on it is :

A. 20 cm

B. 80 cm

C. 40 cm

D. 120 cm

Answer: B

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2. A string of mass 2.50 kg is under a tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end?

A. $0.5s$

B. 1s

C. $1.5s$

D. 2s

Answer: A

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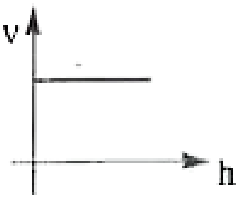
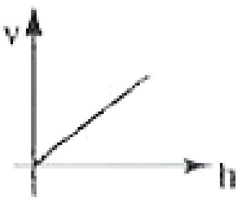
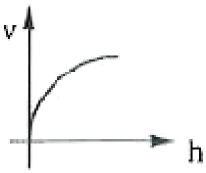
3. A Uniform rope having mass m hags vertically from a rigid support. A transverse wave pulse is produced at the lower end. The speed v of wave pulse varies with height h from the lower end as



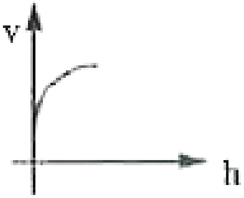
A.



B.



C.

D. 

Answer: C

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4. The length of a sonometer wire AB is 100 cm, where should the two bridges be placed from A to divide the wire in 3 segments whose fundamental frequencies are in the ratio of 1:2:6

A. 30 cm, 90 cm

B. 60 cm, 90 cm

C. 40 cm, 80 cm

D. 20 cm, 30 cm

Answer: B

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5. A 5.5 m length of string has a mass of 0.035 kg. If the tension in the string is 77 N the speed of a wave on the string is

A. $110m/s$

B. $165m/s$

C. $77m/s$

D. $102m/s$

Answer: A

Watch Video Solution

6. The length of a sonometer wire tuned to a frequency of-256 Hz is 0.6 m. Calculate the frequency of the tuning fork with which the vibrating wire will be in tune when the length is made 0.4 m.

A. 78 Hz

B. 512 Hz

C. 384 Hz

D. 126 Hz

Answer: C

Watch Video Solution

7. The fundamental frequency of a string stretched with a weight of 4 kg is 256 Hz. The weight required to produce its octave is

A. 4 kg wt

B. 12 kg wt

C. 16 kg wt

D. 24 kg wt

Answer: C

Watch Video Solution

8. Two strings A and B of equal thickness are made of the same material. The length of A is 1/3rd that of B while tensions in A is thrice that in B. Compare the velocities of the transverse wave on them.

A. $\sqrt{2}:1$

B. $1:\sqrt{2}$

C. $2:1$

D. $1:2$

Answer: C

Watch Video Solution

9. The density of the stretched string is changed by 2% without change in tension and radius. The change in transverse wave velocity.

A. 2 % increase

B. 1% increase

C. 1% increase or decrease

D. 4% change

Answer: C

Watch Video Solution

10. The tension in the string is changed by 2% what is the change in the transverse wave velocity

A. 1%

B. 2%

C. 3%

D. 4%

Answer: A

Watch Video Solution

11. To increase the frequency by 20 % ,the tension in the string vibrating on a sonometer has to be increased by

A. $44\ \%$

B. $33\ \%$

C. $22\ \%$

D. $11\ \%$

Answer: A

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12. When the tension in a string is increased by 44%. the frequency increased by 10Hz the frequency of the string is

A. 100 Hz

B. 200 Hz

C. 150 Hz

D. 50 Hz

Answer: D

Watch Video Solution

13. A wire having a linear mass density $5.0 \times 10^{-3} kg/m$ is stretched between two rigid supports with a tension of 450 N. The wire resonates at a frequency of 420 Hz. The next higher frequency at which the same wire resonates is 490 Hz. Find the length of the wire.

A. $1.2m$

B. $1.8m$

C. $2.1m$

D. $8.1m$

Answer: C

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14. In order to double the frequnecy of the fundamental note emitted by a stratched string the length is reduced to $\frac{3}{4}$ th of the original length and the tension is changed. The factor by which the tension is to be changed is

A. $3/8$

B. $2/3$

C. $8/9$

D. $9/4$

Answer: D

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15. Two uniform strings A and B made of steel are made to vibrate under the same tension. If the first overtone of A is equal to the second overtone of B and if the radius of A is twice that of B, the ratio of the lengths of the strings is

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:5$

Answer: B

Watch Video Solution

16. Transverse waves are generated in two uniform steel wires A and B by attaching their free ends to a fork of frequency $500Hz$. The diameter of wire A is half that B and tension in wire A is half the tension in wire B. What is the ratio of velocities of waves in A and B?

A. $1:2$

B. $2:1$

C. $1:\sqrt{2}$

D. $\sqrt{2}:1$

Answer: D

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17. The third overtone produced by a vibrating string 0.5m long is 1200Hz. The speed of propagation of the wave in ms^{-1} is

A. 400

B. 300

C. 600

D. 1200

Answer: B

Watch Video Solution

18. A wave of frequency 100 Hz is sent along a string towards a fixed end. When this wave travels back after reflection, a node is formed at a distance of 10 cm frome the fixed end of the string. The speed of incident (and reflected) wave are

A. $40m/s$

B. $20m / s$

C. $10m / s$

D. $5m / s$

Answer: B

Watch Video Solution

19. Two uniform strings A and B made of steel are made to vibrate under the same tension. If the first overtone of A is equal to the second overtone of B and if the radius of A is twice that of B, the ratio of the lengths of the strings is

A. $2:3$

B. $1:2$

C. $1:3$

D. $1:4$

Answer: C

Watch Video Solution

20. Two strings of the same material and the same area of cross-section are used in sonometer experiment. One is loaded with 12kg and the other with 3 kg. The fundamental frequency of the first string is equal to the first overtone of the second string. If the length of the second string is 100 cm, then the length of the first string is

A. 30 cm

B. 200 cm

C. 100 cm

D. 50 cm

Answer: C

Watch Video Solution

21. A unifrom rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_1 is attched to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope.

The wavelength of the pulse when it reaches the top of the rope is $\lambda_2 theratio \lambda_2 / \lambda_1$ ia

A. $\sqrt{\dfrac{m_1}{m_2}}$

B. $\sqrt{\dfrac{m_1 + m_2}{m_2}}$

C. $\sqrt{\dfrac{m_2}{m_2}}$

D. $\sqrt{\dfrac{m_1 + m_2}{m_1}}$

Answer: B

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22. A wave in a string has an amoplitude of 2cm. The wave travels in the postivei direction of x-axis with a speed of

$128ms^{-1}$ and it is noted that 5 complete waves fit in 4 m length of the string. The equation describing the wave is

A. $y = (0.02)m \sin(7.85x + 1005t)$

B. $y = (0.02)m \sin(15.7x + 2010t)$

C. $y = (0.02)m \sin(15.7x - 2010t)$

D. $y = (0.02)m \sin(7.85x - 1005t)$

Answer: D

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23. A taut string at both ends viberates in its n^{th} overtone. The distance between adjacent Node and Antinode is found to be 'd'. If the length of the string is L, then

A. $2d(n+1)$

B. $d(n+1)$

C. 2dn

D. $2d(n-1)$

Answer: A

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EXERCISE-II (Velocity of Sound:)

1. The temperature at which the speed of sound in air becomes double of its value at $0^{\circ}C$

A. 273 K

B. 546 K

C. 1092 K

D. 0 K

Answer: C

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2. The ratio of the speed of sound in nitrogen gas to that in helium gas at $300K$ is.

A. $\sqrt{2/7}$

B. $\sqrt{1/7}$

C. $\sqrt{3}/5$

D. $\sqrt{6}/5$

Answer: C

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3. The speed of sound in air at $15^{\circ}C$ and 76 cm of Hg is 340 m/s. The speed of sound in air at $30^{\circ}C$ and 75 cm of Hg will be in m/s)

A. $340\sqrt{\frac{303}{288}}$

B. $340\sqrt{\frac{208}{303}}$

C. $340\sqrt{2}$

D. $340\sqrt{\frac{2 \times 75}{76}}$

Answer: A

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4. The velocities of sound in an ideal gas at temperature T_1 and T_2 K are found to be V_1 and V_2 respectively. If ther.m.s velocities of the molecules of the same gas at the same temperatures T_1 and T_2 are v_1 and v_2 respectively then

A. $v_1 = v_1\left(\frac{V_1}{V_2}\right)$

B. $v_1 = v_1\left(\frac{V_2}{V_1}\right)$

C. $v_1 = v_1\sqrt{\frac{V_2}{V_1}}$

D. $v_1 = v_1\sqrt{\frac{V_1}{V_2}}$

Answer: B

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5. v_1 and v_2 are the velocities of sound at the same temperature in two monoatomic gases of densities ρ_1 and ρ_2 respectively. If $\frac{\rho_1}{\rho_2} = \frac{1}{4}$ then the ratio of velocities v_1 and v_2 is

A. $1:2$

B. $4:1$

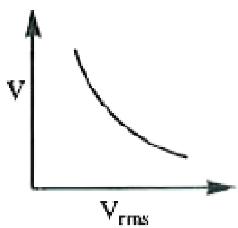
C. $2:1$

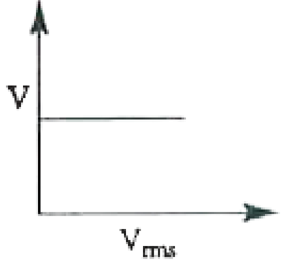
D. $1:4$

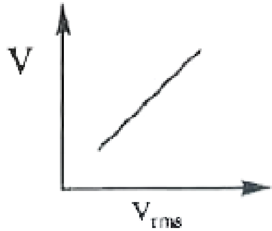
Answer: C

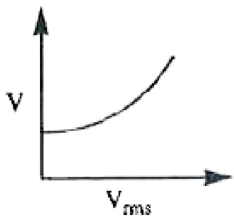
Watch Video Solution

6. For an ideal gas, the graph representing the variation of the speed of sound (v) in a gas, with the r.m.s. speed (vrms) of its gas molecules with be

A. 

B. 

C. 

D. 

Answer: C

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7. The speed of sound in oxygen (O_2) at a certain temperature is $460 ms^{-1}$. The speed of sound in helium (He) at the same temperature will be (assumed both gases to be ideal)

A. $1420 ms^{-1}$

B. $500 ms^{-1}$

C. $650 ms^{-1}$

D. $330 ms^{-1}$

Answer: A

Watch Video Solution

8. A steel rod 100 cm long is dampled at into middle.Then fundamental frequnecy of longitudinal vibrations of the rod are given to be 2.53 kHz.What is the speed of sound in sound is steel?

A. $10.12km/s$

B. $5.06km/s$

C. $2.53km/s$

D. $20.24km/s$

Answer: B

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EXERCISE-II (Pipes)

1. An open organ pipe sounds a fundamental note of frequency 330 Hz. If the speed in air is 330 m/s then the length of the pipe is nearly

A. $0.25m$

B. $0.50m$

C. $0.75m$

D. $2.00m$

Answer: B

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2. A cylindrical tube, open at both ends, has a fundamental frequency f in air . The tube is dipped vertically in water so that half of its length is in water. The fundamental frequency of the air column is now

(a) $f / 2$

(b) $3f / 4$

(C) f

(d) $2f$

A. $3f_0 / 4$

B. f_0

C. $f_0 / 2$

D. $2f_0$

Answer: B

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3. An organ pipe P_1 closed at one end vibrating in its first harmonic and another pipe P_2 open at both ends vibrating in its third harmonic are in resonance with a given tuning fork. The ratio of the length of P_1 and p_2 is

(a) $8/3$ (b) $3/8$ (c) $1/6$ (d) $1/3$

A. $\frac{8}{3}$

B. $\frac{3}{8}$

C. $\frac{1}{2}$

D. $\frac{1}{3}$

Answer: B

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4. An open pipe 30 cm long and a closed pipe 23 cm long, both of the same diameter, are each sounding their first overtone are in unison. The end correction of these pipes is

A. $0.5cm$

B. $0.3cm$

C. 1 cm

D. $1.2cm$

Answer: C

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5. Two closed organ pipes of length 100 cm and 101cm give 16 beats in 20 sec. When each pipe is sounded in its fundamental mode calculate the velocity of sound.

A. 303 m/s

B. 332 m/s

C. 323.2 m/s

D. 300 m/s

Answer: C

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6. If I_1, I_2 and I_3 are wave lengths of the waves giving resonance with fundamental, first and second over tones of closed organ pipe. The ratio of wavelengths $I_1 : I_2 : I_3$ is ......

A. $1:2:3$

B. $1:\frac{1}{3}:\frac{1}{5}$

C. $1:3:5$

D. $5:3:1$

Answer: B

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7. An open organ pipe and closed pipe have same length. The ratio of frequencies of their n^{th} over tone is

A. $\dfrac{n+1}{2n+1}$

B. $\dfrac{2(n+1)}{2n+1}$

C. $\dfrac{n}{2n+1}$

D. $\dfrac{n+1}{2n}$

Answer: B

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8. two pipes have each of length 2 m, one is closed at on end and the other is open at both ends. The speed of sound in air is 340 m/s . The frequency at which both can resonate is ?

A. 340 Hz

B. 510 Hz

C. 42.5 Hz

D. does not exist

Answer: D

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9. The first overtone of an open pipe has frequency n. The first ovetone of a closed pipe of the same length will have frequency

A. $n/2$

B. 2n

C. $3n/4$

D. $4n/3$

Answer: C

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10. If a resonance tube is sounded with a tuning fork of frequency 256 Hz, resonance occurs at 35 cm and 105 cm. The velocity of sound is about

A. 360 m/s

B. 512 m/s

C. 524 m/s

D. 400 m/s

Answer: A

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11. Fundamental frequency of pipe is 100 Hz and other two frequencies are 300 Hz and 500 Hz then

A. Pipe is open at both the ends

B. pipe is closed at both the ends

C. One end open and another end is closed

D. None of the above

Answer: C

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12. While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at a column length of 18 cm during winter. Repeating the same experiment during summer, she measure the column length to be x cm for the second resonance. Then

A. $18 > x$

B. $x > 54$

C. $54 > x > 36$

D. $36 > x > 18$

Answer: B

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13. An air column, closed at one end and open at the other, resonates with a tunning fork when the smallest length of the coloumn is 50 cm. The next larger length of the column resonating with the same tunning fork is

A. $66.7cm$

B. $100cm$

C. 150 cm

D. 200 cm

Answer: C

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EXERCISE-II (Beats :)

1. Two vibrating tunign forks produce progessive waves given by

$y_1 = 4 \sin 500 \pi t$ and $y_2 2 \sin 506 \pi t$.

Number of beat produced pre minture is .

A. 360

B. 180

C. 3

D. 60

Answer: B

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2. Two tuning forks when sounded together produce 5 beats in 2 seconds. The time interval between two successive maximum intensities of sound is

A. $0.5s$

B. $0.2s$

C. $0.4s$

D. $0.3s$

Answer: C

Watch Video Solution

3. Two stretched wires of same length, diameter and same material are in unison. The tension in one is increased by 2% and 2 beats per second are heard. What was the frequency of the note produced when they were in unision

A. 100 Hz

B. 200 Hz

C. 300 Hz

D. 400 Hz

Answer: B

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4. Two progressive waves $y_1 = 4 \sin 400\pi t$ and $y_2 = 3 \sin 404\pi t$ moving in the same direction superpose on each other producing beats. Then the number of beats per second and the ratio of maximum to minimum intensity of the resultant waves are respectively

A. $2 \text{ and } \frac{5}{1}$

B. $4 \text{ and } \frac{49}{1}$

C. $4 \text{ and } \frac{16}{9}$

D. $2 \text{ and } \frac{49}{1}$

Answer: D

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5. The frequency of a tuning fork A is 5% greater than that of a standard fork K. The frequency of another fork B is 3% less than that of K. When A and B are vibrated simulataneously 4 beats per second are heard. Find the frequencies of A and B.

A. 52.5 Hz, 48.5 Hz

B. 63.5 Hz, 79.5 Hz

C. 10.5 Hz, 10.1 Hz

D. 124 Hz, 120 Hz

Answer: A

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6. 64 tuning forks are arranged such that each fork produces 4 beats per second with next one. If the frequency of the last fork is octave of the first, the frequency of 16th fork is

A. 316 Hz

B. 322 Hz

C. 312 Hz

D. 308 Hz

Answer: C

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7. A tuning fork of unknown frequency produces 4 beats per second with another fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 beats per second. The unknown frequency is:

A. 286 cps

B. 292 cps

C. 294 cps

D. 288 cps

Answer: B

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8. A tuning fork produces 7 beats/s with a tuning fork of frequency 248Hz. Unknown fork is now loaded and 7 beats/s are still heard. The frequency of unknown fork was

A. 241 Hz

B. 248 Hz

C. 255 Hz

D. 234 Hz

Answer: C

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9. Tuning fork A of frequency 258 Hz gives 8 beats with a tuning fork B. When the tuning fork A is filed and again A and B are sounded the number of beats heard decreases. The frequency of B is

A. 250 Hz

B. 264 Hz

C. 258 Hz

D. 266 Hz

Answer: A

Watch Video Solution

10. Two tuning forks A and B vibrating simultaneously produces, 5 beats. Frequency of B is 512. It is seen that if one arm of A is filed, then the number of beats increases. Frequency of A will be

A. 502 Hz

B. 507 Hz

C. 517 Hz

D. 522 Hz

Answer: C

Watch Video Solution

11. Tuning fork A of frequency 258 Hz gives 8 beats with a tuning fork B. When the tuning fork A is filed and again A and B are sounded the number of beats heard decreases. The frequency of B is

A. 250 Hz

B. 266 Hz

C. 258 Hz

D. 242 Hz

Answer: B

Watch Video Solution

12. Two tuning forks A and B vibrating simultaneously produces, 5 beats. Frequency of B is 512. It is seen that if one arm of A is filed, then the number of beats increases. Frequency of A will be

A. 502 Hz

B. 507 Hz

C. 517 Hz

D. 522 Hz

Answer: C

Watch Video Solution

13. A tuning fork of frequency 340 Hz produces 5 beats per second with a sonometer wire. If the tension is slightly increased the number of beats becomes 4. The frequency of sonometer wire is

A. 335 Hz

B. 345 Hz

C. 330 Hz

D. 350 Hz

Answer: A

Watch Video Solution

14. Two tuning forks x and y produce tones of frequencies 256 Hz and 262 Hz respectively, An unknown tone sounded with x produces, beats. When it is sounded with y the number of beats produced is doubled. The unknown frequency is

A. 254 Hz

B. 258 Hz

C. 264 Hz

D. 259 Hz

Answer: B

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15. A source frequency f gives 5 beats when sounded with a frequency 200Hz. The second harmonic of same source gives 10 beats when sounded with a source of frequency 420Hz. The value of f is

A. 200 Hz

B. 210 Hz

C. 205Hz

D. 195 Hz

Answer: C

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16. The wavelength of two notes in air are $\frac{40}{195}m$ and $\frac{40}{193}m$. Each note produces 9 beats per second separately with third note of fixed frequency. The velocity of sound in air in m/s is

A. 360

B. 320

C. 330

D. 340

Answer: A

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17. When a vibrating tuning fork is placed on a sound box of a sonometer, 8 beats per second are heard when the length of the sonometer wire is kept at 101cm or 100cm. Then the frequency of the tuning frok is (consider that the tension in the wire is kept constant)

A. 1616 Hz

B. 1608 Hz

C. 1632 Hz

D. 1600 Hz

Answer: B

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18. Three sound waves of equal amplitudes have frequencies (n-1),n,(n+1)`. The superimpose to give beats . The number of beats produced per second will be

A. 3

B. 2

C. 1

D. 4

Answer: B

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19. The frequencies of three tuning forks A, B and C have a relation $n_A > n_B > n_C$. When the forks A and B are sounded together the number of beats produced is n_1 When A and C are sounded together the number of beats produced is n_2 then the number of beats produced when B and C are sounded together is

A. $n_1 + n_2$

B. $\frac{n_1 + n_2}{2}$

C. $n_2 - n_1$

D. $n_1 - n_2$

Answer: C

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20. Two identical piano wires have a fundamental frequency of 600 cycle per second when kept under the same tension. What fractional increase in the tension of one wire will lead to the occurrence of 6 beats per second when both wires vibrate simultaneously?

A. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: B

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EXERCISE-II (Doppler Effect :)

1. A whistle producing sound waves of frequencies 9500 Hz and above is approaching a stationary person with velocity v meters per sound. The velocity of sound in air is 300 m/s. If person can hear frequencies up to 10000 Hz, the maximum value of v up to which he can hear the whistle is

A. $30ms^{-1}$

B. $15\sqrt{2}ms^{-1}$

C. $15\sqrt{2}ms^{-1}$

D. $15ms^{-1}$

Answer: D

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2. A source of sound is travelling towards a stationary observer. The frequency of sound heard by the observer is 25% more that the actual frequency. If the speed of sound is v, that of the source is

A. $\frac{v}{5}$

B. $\frac{v}{4}$

C. $\frac{v}{3}$

D. $\frac{v}{2}$

Answer: A

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3. To an observer, the pitch of a stationary source of sound appears to be reduced by 20%. If the speed of sound is 340m/s then speed and direction of the observer is

A. 86 m/s towards the source

B. 68 m/s towards the source

C. 86 m/s away from the source

D. 68 m/s away from the source

Answer: D

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4. An observer moves towards a stationary source of sound with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

A. 0.05

B. 0.2

C. zero

D. $0.5\,\%$

Answer: B

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5. When both source and observer approach each other with a speed a equal to the half the speed of sound, then determine the percentage change in frequency of sound as detected by the listener.

A. n

B. 2n

C. $\frac{n}{2}$

D. 3n

Answer: B

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6. An engine giving off whistle is moving towards a stationary observer with 50m/s speed. What will be the ratio of the frequencies of the whistle heard when engine is approaching and receding from the observer? (speed of sound = 350 m/s)

A. $2:1$

B. $4:5$

C. $4:3$

D. $3:4$

Answer: C

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7. A train running at 108 km/hr towards east whistles at a frequency of 800 Hz. The frequencies heard by a passenger sitting in the train and a person standing near the track whom the train has just passed (Speed of Sound =330 m/s)

A. 800 Hz, 733 Hz

B. 740 Hz, 800 Hz

C. 800 Hz, 880 Hz

D. 800 Hz, 750 Hz

Answer: A

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8. A source and a detector move away from each other, each with a speed of 10 m/s with respect to ground with no wind. If the detector detects a frequency 1650 Hz of the sound coming from the source, what is the original frequency of the source? (speed of sound = 340 m/s

A. 750 Hz

B. 1750 Hz

C. 2000 Hz

D. 1800 Hz

Answer: B

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9. Two trains are moving towards each other at speeds of 144 km/hr and 54 km/hr relative to the ground. The first train sounds a whistle of frequency 600 Hz. Find the frequency of the whistle as heard by a passenger in the second train before the trains meet. (v=340m/s)

A. 610 Hz

B. 510 Hz

C. 710 Hz

D. 170 Hz

Answer: C

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10. A Car is travelling at $\frac{v}{10}ms^{-1}$ and sounds horn of frequency 990 Hz. The apparent frequency heard by a police chasing the car at $\frac{v}{9}ms^{-1}$, where V is velocity of sound

A. 990 Hz

B. 900 Hz

C. 1000 Hz

D. 0

Answer: C

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11. A source is moving with a constant speed of 10 m/s on a circular track of 200 m. It emits a sound of frequency 200 Hz. A listener stands at the centre of the circular track. The frequency received by the listener is (velocity of sound = 340 m/s)

A. zero

B. 200 Hz

C. 190 Hz

D. 210 Hz

Answer: B

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12. A car travels at a speed of 'a' towards a high wall. The driver sounds a horn of frequency 'n'. If V is the velocity of sound in air, frequency of reflected sound heard by the driver is

A. $n\frac{V+a}{V-a}$

B. $n\frac{V-a}{V+a}$

C. $n\frac{V+a}{V}$

D. $n\frac{V-a}{V}$

Answer: A

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13. The wave length of the sound produced by a source is 0.8m. If the source moves towards the stationary listner at $32ms^{-1}$, what is the apparent wave length of sound if the velocity of sound is $320ms^{-1}$

A. $0.32m$

B. $0.4m$

C. $0.72m$

D. $0.80m$

Answer: C

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14. A person going away from a factory on his scooter at a speed of 36 km/hr listens to the siren of the factory. If the actual frequency of the siren is 700 Hz and a wind is blowing along the direction of the scooter at 36 km//hr, find the observed frequency heard by the person. (Given speed of sound $= 340m/s$)

A. 680 Hz

B. 510 Hz

C. 640 Hz

D. 600 Hz

Answer: B

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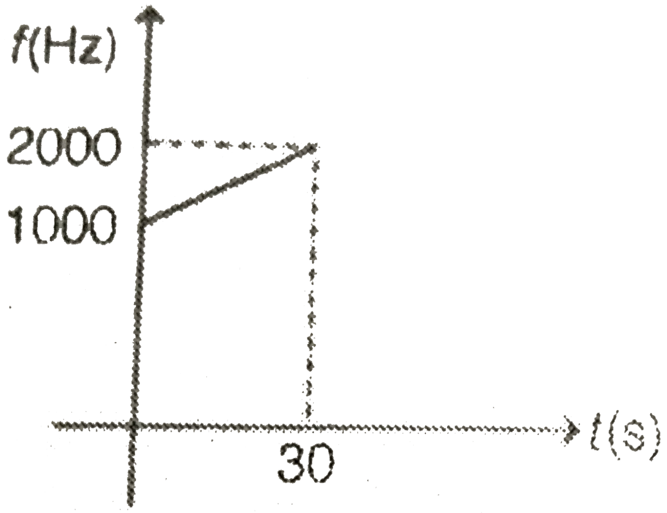
15. A detector is released from rest over a source of sound of frequency $f_0 = 10^3 Hz$. The frequency observed by the detector at time t is plotted in the graph. The speed of sound in air is $(g = 10m / s^2)$



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16. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. $2.0m - s^{-1}$

B. $2.5m - s^{-1}$

C. $3.0m - s^{-1}$

D. $3.5m - s^{-1}$

Answer: B

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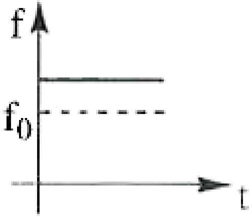
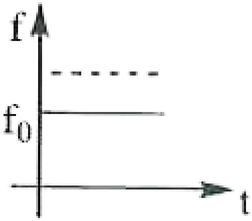
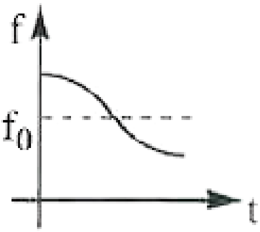
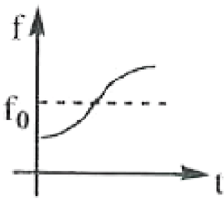
17. source and observer both start moving simultaneously from origion one along y - axis with speed of source = 2 (speed of observer). The graph between the apparent frequency observed by observer (f) and time (t) would be

A. 

B. 

C. 

D. 

Answer: B

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18. An observer is standing 500 m away from a vertical hill. Starting between the observer and the hill, a police van sounding a siren of frequency 1000 Hz moves towards the hill with a uniform speed. If the frequency of the sound heard directly from the siren is 970 Hz, the frequency of the sound heard after reflection from the hill (in Hz) is about,(velocity of sound = $330ms^{-1}$

A. 1042

B. 1032

C. 1022

D. 1012

Answer: B

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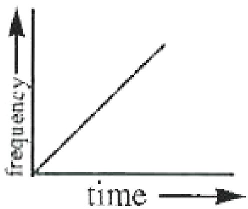
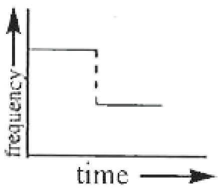
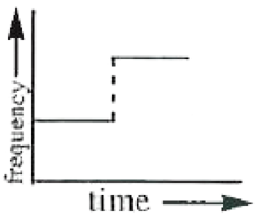
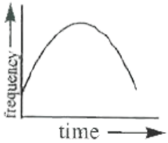
19. A roller skater carrying a portable stereo skates at constant speed an observer at rest. Which of the following accurately represents how are frequency perceived by the observer changes with time?

A. 

B. 

C. 

D. 

Answer: B

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20. A motorcycle starts from rest and accelerates along a straight path at $2\frac{m}{s^2}$. At the starting point of the motorcycle, there is a stationary electric siren. How far has the motorcycle gone when the driver hears the frequency of the siren at 94% of its value when the motorcycle was at rest? (Speed of sound = 330 m/s)

A. 98 m

B. 147 m

C. 196 m

D. 49 m

Answer: A

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21. The driver of a car treavelling with speed $30ms^{-1}$ toward a hill sounds a horn of frequenvy 600 Hz. If the velocity of sound in air is $300ms^{-1}$ the frequency of reflected sound as heard by diver is

A. $555.5Hz$

B. 720 Hz

C. 500 Hz

D. 550 Hz

Answer: B

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22. A siren emiting a sound of frequency 800 Hz moves away from on obsever towards a cliff at a speed of $15ms^{-1}$ Then the frequency of sound that the observer hears in the echo reflected from the cliff is (take m Velocity of sound in air $= 330ms^{-1}$)

A. 765 Hz

B. 800 Hz

C. 838 Hz

D. 885 Hz

Answer: C

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23. The two harmonics of a tube closed at one end and open at other are 200 Hz and 260 Hz. What is the funamental frequency of the system?

A. 40 Hz

B. 10 Hz

C. 20 Hz

D. 30 Hz

Answer: C

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EXERCISE-III (Wave Equations & Basics)

1. A transverse wave of amplitude $0.50m$ wavelength $1m$ and frequency $2Hz$ is propagating on a string in the negative $x-$ direction . The expression of the wave is

A. $y = 0.5\sin(2\pi x - 4\pi t)$

B. $y = 0.5\sin(2\pi x + 4\pi t)$

C. $y = 0.5\sin(\pi x - 2\pi t)$

D. $y = 0.5\sin(2\pi x + 2\pi t)$

Answer: B

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2. The time lag between two particles vibrating in a progressive wave seperated by a distance 20m is 0.02s. The wave velocity If the frequency of the wave is 500Hz, is

A. $1000ms^{-1}$

B. $500ms^{-1}$

C. $2000ms^{-1}$

D. $250ms^{-1}$

Answer: A

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3. The path difference between the two waves :

$y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$ and

$y_2 = a_2 \cos\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$ is

A. $\frac{\lambda}{2\pi}\phi$

B. $\frac{\lambda}{2\pi}\left(\phi + \frac{\pi}{2}\right)$

C. $\frac{\lambda}{2\pi}\left(\phi - \frac{\pi}{2}\right)$

D. $\frac{2\pi}{\lambda}\phi$

Answer: B

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4. The maximum particle velocity is 3 times the wave velocity of a progressive wave. If the amplitude of the particle is "a". The phase difference between the two particles seperated by a distance of 'x' is

A. $\frac{x}{a}$

B. $\frac{3x}{a}$

C. $\frac{3a}{x}$

D. $\frac{3\pi x}{a}$

Answer: B

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5. The ends of a stretched wire of length L are fixed at x = 0 and x = L, In one experiment, the displacement of wire is $y_1 = A\sin(\pi x / L)\sin\omega t$ and energy is E_1 and in another experiment its displacement is $y_2 = A\sin(2\pi x / L)\sin 2\omega t$ and energy is E_2. Then

A. $E_2 = E_1$

B. $E_2 = 2E_1$

C. $E_2 = 4E_1$

D. $E_2 = 16E_1$

Answer: C

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6. Two transverse waves A and B superimposed to produce a node at x = 0. If the equation of wave A si $y = a\cos(kx - \omega t)$, then the equation of wave B is

A. $y = a\sin(wt + kx)$

B. $y = a\cos(wt - kx)$

C. $y = -a\cos(kx - wt)$

D. $y = -a\sin(kx + wt)$

Answer: D

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7. The transverse displamcement y(x,t) of a wave y(x,t) on a string is given by yox, t) = . This represents a

A. wave moving in -x direction with speed $\sqrt{\frac{b}{a}}$

B. standing wave of frequency $\sqrt{b}$

C. standing wave of frequency $\frac{1}{\sqrt{b}}$

D. wave moving in +x direction with $\sqrt{\frac{a}{b}}$

Answer: A

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EXERCISE-III (Strings (Speed of travelling wave))

1. A metal wire of linear mass density of $9.8 g/m$ is stretched with a tension of $10 kg - wt$ between two rigid support $1 meter$ apart. The wire passes at its middle point between the poles of a permanent magnet, and it vibrates in resonance when carrying an alternating current of frequency n. the frequency n of the alternating source is

A. 25 Hz

B. 50 Hz

C. 100 Hz

D. 200 Hz

Answer: B

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2. A sonometer wire is vibrating in resonance with a tuning fork. Keeping the tention applied same, the length of the wire is doubled. Under what conditions would the tuning for still be is resonance with the wire ?

A. 4 segments

B. 6 segments

C. 3 segments

D. 2 segments

Answer: D

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3. Transverse waves are generated in two uniform wires A and B of the same material by attaching their free ends to a vibrating source of frequency 200 Hz. The Area of cross section of A is half that of B while tension on A is twice than on B. The ratio of wavelengths of the transverse waves in A and B is

A. $1:\sqrt{2}$

B. $\sqrt{2}:1$

C. $1:2$

D. $2:1$

Answer: D

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4. A stretched wire of stone length under a tension is vibrating with its fundamental frequency . Its length is decreased by $45\ \%$ and tension is increased by $21\ \%$. Now fundamental frequency

A. increases by 50%

B. increases by 100%

C. decreases by 50%

D. decreases by 25%

Answer: B

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5. If n_1, n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of string is given by

A. $\dfrac{n_1 n_2 n_3}{n_1 + n_2 + n_3}$

B. $\dfrac{n_1 n_2 + n_2 n_3 + n_3 n_1}{n_1 n_2 n_3}$

C. $\dfrac{n_1 n_2 n_3}{n_1 n_2 + n_2 n_3 + n_3 n_1}$

D. $\dfrac{n_1 n_2 n_3}{n_1 n_1 + n_2 n_2 + n_3 n_3}$

Answer: C

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6. The equation for the vibration of a string fixed at both ends vibrating in its second harmonic is given by $y = 2\sin\left(0.3cm^{-1}\right)x\cos\left(\left(500\pi s^{-1}\right)t\right)cm$. The length of the string is :

A. $24.6cm$

B. $12.5cm$

C. $20.6cm$

D. $154.7cm$

Answer: D

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7. A steel wire of length 1 m, mass 0.1 kg and uniform cross-sectional area $10^{-6}m^2$ is rigidly fixed at both ends. The temperature of wire is lowered by 20°C. If transverse waves are set up by plucking the string in the middle, calculate the frequency (In S.I. units) of the fundamental mode of vibration. Young's modulus of steel $= 2 \times 10^{11} N/m^2$, coefficient of linear expansion of steel $= 1.21 \times 10^{-6} (degC)^{-1}$.

A. 22 Hz

B. 33 Hz

C. 44 Hz

D. 11 Hz

Answer: D

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8. A metallic wire with tension T and at temperature $30^{\circ} C$ vibrates with its fundamental frequency of $1kHz$. The same wire with the same tension but at $10^{\circ} C$ temperature vibrates with a fundamental frequency of $1.001kHz$. The coefficient of linear expansion of the wire is equal to $10^{-K} . ^{\circ} C$. Find $2K$.

A. $2 \times 10^{-4} / ^{\circ} C$

B. $1.5 \times 10^{-4} / {}^{\circ} C$

C. $1 \times 10^{-4} / {}^{\circ} C$

D. $0.5 \times 10^{-4} / {}^{\circ} C$

Answer: C

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9. Two wires of same material of radii 2r and r are welded together end to end The combination is used as a sonometer wire and is kept under tension T. The welded point lies midway between the bridges. What wil be the ratio of the number of loops formed in the wires, such that the joint is node when the stationary waves are set up in the wire?

A. $\frac{1}{4}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{2}{3}$

Answer: C

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10. A somoneter wire resonates with a given tuning fork forming standing waves with five antindoes between the two bridges when a mass of 9 kg is suspended from the wire. Resonates with the same tuning fork forming three antindoes for the same postions of the bridges. the value of M is

A. 25 kg

B. 5 kg

C. 12.5 kg

D. 1/25 kg

Answer: A

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11. A sonometer wire of 70cm length fixed at one end has a solid mass M, hanging from its other end to produce tension in it. The wire produces a certian frequency. When the same mass 'M' hanging in water, it is found that the length of the wire has to be changed by 5 cm. in order to produce the same frequency. Then the density of the material of mass 'M' is

A. 5 gm /c.c

B. 1 gm/ c.c

C. $\frac{169}{27} gm / c.c$

D. $\frac{196}{27} gm / c.c$

Answer: D

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12. An iron load of 2 kg is suspended in the air from the free end of a sonometer wire of length 1 m. A tuning fork of frequency 256 Hz is in resonance with $\frac{1}{\sqrt{7}}$ times the length of the sonometer wire. If the load is immersed in water, the fraction of length of the wire that will be in resonance with the same tuning fork, will be (specific gravity of iron = 8) (assume both cases in same harmonic)

A. $\sqrt{8}$

B. $\sqrt{6}$

C. $\frac{1}{\sqrt{6}}$

D. $\frac{1}{\sqrt{8}}$

Answer: D

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13. Two strings A and B of lengths , $L_A = 80cm$ and $L_B = x$ cm respectively are used separately in a sonometer. The ratio of their densities is 0.81. the diameter of B is one -half that of A. if the strings have the same tension and fundamental frequency the value of x is

A. 33

B. 102

C. 144

D. 130

Answer: C

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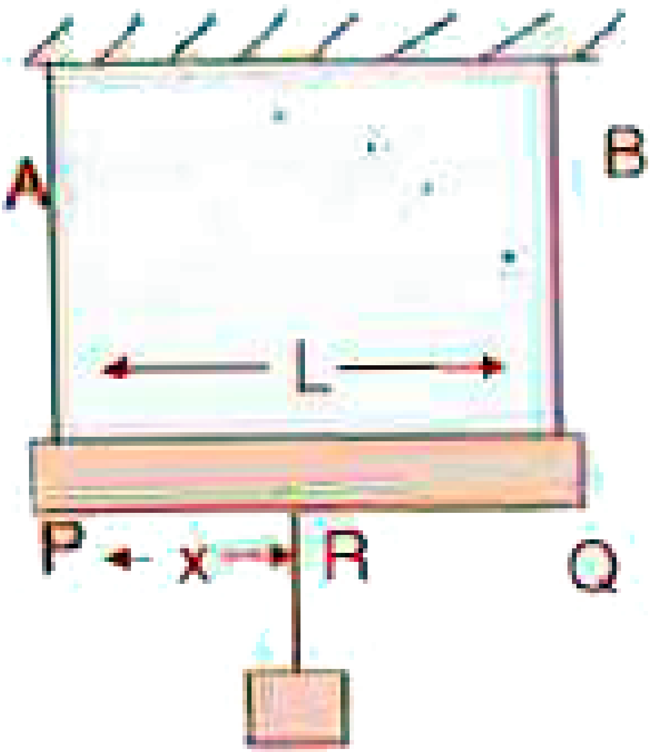
14. A rod PQ of length 'L' is hung from two identical wires A and B. A block of mass 'm' is hung at point R of the rod as shown in figure. The value of 'x' so that the fundamental mode in wire A is in resonance with first overtone of B is



A. $\frac{4L}{5}$

B. $\frac{L}{4}$

C. $\frac{L}{5}$

D. $\frac{2L}{3}$

Answer: C

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15. The total length of a sonometer wire fixed between two bridges is 110 cm. Now, two more bridges are placed to divide the length of the wire in the ratio $6:3:2$. If the tension in the wire is 400 N and the mass per unit length of the wire is $0.01\,\mathrm{kg\,m}^{-1}$, then the minimum common frequency with which all the three parts can vibrate, is

A. 166 Hz

B. 1000 Hz

C. 500 Hz

D. 1100 Hz

Answer: B

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EXERCISE-III (Velocity of Sound :)

1. Two monatomic ideal gas 1 and 2 of molecular masses m_1 and m_2 respectively are enclosed in separate containers kept at same temperature. The ratio of the speed of sound in gas 1 to that in gas 2 is given by

A. $\sqrt{\frac{m_1}{m_2}}$

B. $\sqrt{\frac{m_2}{m_1}}$

C. $\frac{m_1}{m_2}$

D. $\frac{m_2}{m_1}$

Answer: B

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2. A sample of oxygen at NTP has volume V and a sample of hydrogen at NTP has the volume 4V. Both the gases are mixed. If the speed of sound in hydrogen at NTP is 1270 m/s, that in mixture is

A. 317 m/s

B. 635 m/s

C. 830 m/s

D. 950 m/s

Answer: B

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3. Oxygen is 16 times heavier than hydrogen. At NTP equal volumn of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is

A. $\sqrt{\frac{1}{8}}$

B. $\sqrt{\frac{32}{17}}$

C. $\sqrt{8}$

D. $\sqrt{\frac{2}{17}}$

Answer: D

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4. A tuning fork produces a wave of wavelength 110 cm in air at $0^{\circ}C$. The wavelength at $25^{\circ}C$ would be

A. 110 cm

B. 115 cm

C. 120 cm

D. 130 cm

Answer: B

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EXERCISE-III (Pipes :)

1. An open pie is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be heigth by $100H_Z$ than the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is

(a) $200H_Z$ (b) $300H_Z$ (c) $240H_Z$ (d) $480H_Z$

A. 200 Hz

B. 300 Hz

C. 240 Hz

D. 480 Hz

Answer: A

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2. If a primary root continues to grow, the type if root system will be known as

A. $\dfrac{2f_1f_2}{2f_2+f_1}$

B. $\dfrac{f_1f_2}{f_2+2f_1}$

C. $\dfrac{2f_1+f_2}{f_1+f_2}$

D. $\dfrac{f_1f_2}{f_1+2f_2}$

Answer: D

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3. Two tuning forks A and B give $18 beats in 2s$. A resonates with one end closed air column of $15cm$ long and B with both ends open column of 30.5 long. Calculate their frequencies.

A. 305, 295 Hz

B. 295 Hz, 300 Hz

C. 305 Hz, 300 Hz

D. 300 Hz, 305 Hz

Answer: C

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4. Two closed pipes droduce 10 beats per second when emiting their fundamental nodes. If their lengths are in ratio of 25:26. Then their fundamental frequencies in Hz are ....

A. 270,280

B. 260,270

C. 260,250

D. 260,280

Answer: C

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5. A pipe of length $85cm$ is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below $1250Hz$. The velocity of sound in air is $340m/s$.

A. 4

B. 2

C. 8

D. 6

Answer: D

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EXERCISE-III (Beats :)

1. Wavelengths of two notes in air are 80/175 m and 80/173 m. Each note produces 4 beats/s. with a third note of a fixed frequency. The speed of sound in air is

A. 400 m/s

B. 300 m/s

C. 280 m/s

D. 320 m/s

Answer: D

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2. A tuning fork of frequency 256 Hz produces 4 beats per second with a wire of length 25 cm vibrating in its fundamental mode. The beat frequency decreases when the length is slightly shortened. What could be the minimum length by which the wire be shortened so that it produces no beats with the tuning fork ?

A. $0.2cm$

B. $0.4cm$

C. $0.3cm$

D. $0.1cm$

Answer: B

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3. The string of a sonometer is divided into two parts with the help of a wedge. The total length of the string is 1 m and the two parts differ by 2mm. When sounded together they produced two beats per second. The frequencies of the notes emitted by the two parts are

A. 499 & 497 Hz

B. 501 & 499 Hz

C. 501 & 503 Hz

D. none

Answer: B

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4. Two uniform wire are vibrating simultaneously in their fundamental modes. The tensions, lengths, diameters, and the densities of the two wires are in the ratios, 8:1 , 36:35 , 4:1 , 1:2 respectively. If the note of higher pitch has a frequency of 360Hz the number of beats produced per second is

A. 5

B. 10

C. 15

D. 20

Answer: B

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5. A closed organ pipe and an open organ pipe of some length produce $2 beats$ when they are set up into vibration simultaneously in their fundamental mode . The length of the open organ pipe is now halved and of the closed organ pipe is doubled , the number of beats produced will be a) 7 b) 4 c) 8 d) 2

A. 4

B. 7

C. 2

D. 8

Answer: B

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6. Two identical flutes produce fundamental notes of frequency 300 Hz at $27^{\circ}C$. If the temperature of the air in one of the flutes is increased to $31^{\circ}C$, the number of beats heard per second will be

A. 1

B. 2

C. 3

D. 4

Answer: B

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EXERCISE-III (Doppler effect :)

1. When a train is approaching the stationary observer, the apparent frequency of the whistle observed as 100 Hz, while when it has passed away from the observer with same speed, it is 50 Hz. Calculate the frequency of the whistle when the observer moves with the train V = 330 m/s)

A. $33.3 Hz$

B. 50 Hz

C. $66.6 Hz$

D. 75 Hz

Answer: C

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2. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. 2 m/s

B. 1.5 m/s

C. 2.5 m/s

D. 4 m/s

Answer: A

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3. Two different sound sources s_1 and so have frequencies ratio 1:2. Source s_2 is approaching towards an observer s_1 and s_2 is receding from the same observer. Speeds of both s_1 and s_2 are the same and equal to v. speed of sound in air in 300 m / s. If no beats are heard by the observer the value of V is

A. $125m/s$

B. $100m/s$

C. $75m/s$

D. $50m / s$

Answer: B

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4. A siren placed at a railway platfrom is emitted sound of frequency $5kH_Z$, A passenger sitting in retun journey in a different train B he records a frequency of $6.0kH_Z$ while approaching the same siren. The ratio of the velocity of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $5 / 6$

D. $11/6$

Answer: B

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5. A train moves towards a stationary observer with speed 34 m/s. The train sounds a whistle and its frequency registered by the observer is f_1. If the speed of train is reduced to 17 m/s, the frequency registered is f_2. If speed fo sound is 340 m/s, then the ratio f_1/f_2 is :

A. $\frac{18}{19}$

B. $\frac{1}{2}$

C. 2

D. $\frac{19}{18}$

Answer: D

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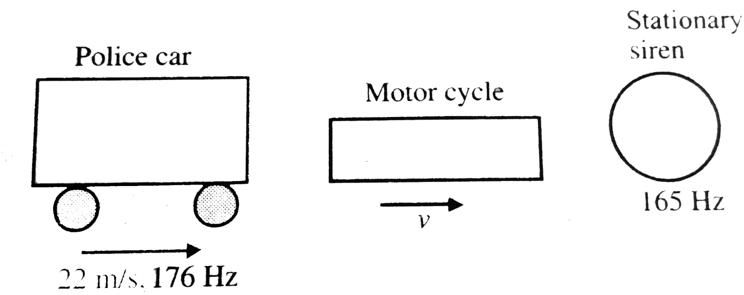

6.

A police car moving at $22\frac{m}{s}$ chases a motorcyclist. The police man sounds his horn of frequency 176 Hz, while both of them move towards a stationary siren of frequency 165 Hz. Calculate the speed of motorcyclist if it is given that he does not hear any beat (speed of sound in air is $330\frac{m}{s}$)

A. 33 m/s

B. 22 m/s

C. zero

D. 11 m/s

Answer: B

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7. A train is moving at 30 m/s in still air. The frequency of the locomotive whistle is 500 Hz and the speed of sound is 345 m/s. The apparent wavelengths of sound in front of and behind the locomotive are respectively :-

A. $0.63m, 0.75m$

B. $0.60m, 0.73m$

C. $0.65m, 0.78m$

D. $0.60m, 0.71m$

Answer: A

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8. A siren emitting a sound of frequency 2000 Hz moves away from you towards a cliff at a speed of 8 m/s.

(a) What is the frequency of the sound you hear coming directly from the siren.

(b) What is the frequency of sound you hear reflected off the cliff. Speed of sound in air is $330\frac{m}{s}$.

A. 1042

B. 1032

C. 1022

D. 1012

Answer: B

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9. A car travelling at a speed of 8 m/s towards a large wall horns a sound of frequency 130 Hz if the person stands behind the car such that the car receding from him approaches the wall the no. of beats heard by him per second is (velocity of speed in air 340 m/s)

A. $35.9Hz$

B. 20Hz

C. 70 Hz

D. 30 Hz

Answer: A

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10. The difference between the apparent frequency of a source of sound as perceived by the observer during its approach and recession is 2% of the natural frequency of the source. If the velocity of sound in air is 300 m/s, the velocity of the source is

A. 12 m/s

B. 6m/s

C. 1.5 m/s

D. 3 m/s

Answer: D

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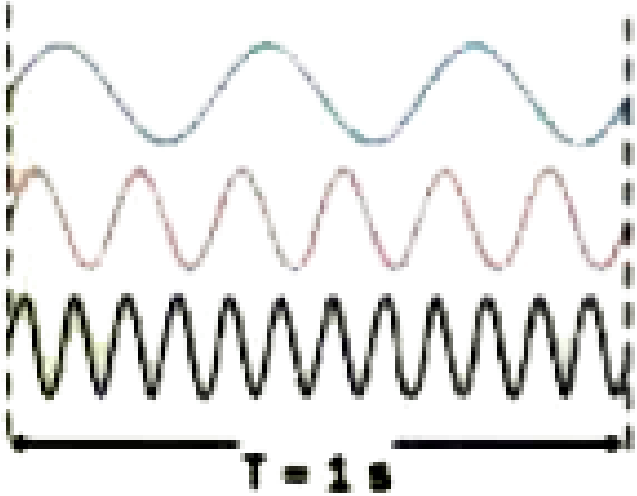
11. Find the frequency of the waves given below.



A. f_0

B. $\dfrac{f_0(v+2g)}{v}$

C. $\dfrac{f_0(v-2g)}{v}$

D. $f_0\left(\dfrac{v}{v-2g}\right)$

Answer: D

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12. A whistle of frequency 540 Hz rotates in a horizontal circle of radius 2 m at an angular speed of $15\frac{rad}{s}$. What is the lowest and the highest frequency heard by a listener a long distance away at rest with respect to the centre of the circle? (Velocity of sound in air is $c = 330\frac{m}{s}$.)

A. 509 Hz

B. 594 Hz

C. 598 Hz

D. 602 Hz

Answer: B

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13. A bat moving at $10ms^{-1}$ towards a wall sends a sound signal of 8000 Hz towards it. On reflection it hears a sound of frequency f. The value of g in Hz is close to (speed to sound $= 320ms^{-1}$) :

A. 8424

B. 8000

C. 8258

D. 8516

Answer: D

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14. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively The driver of the first car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s]

A. 448 Hz

B. 350 Hz

C. 361 Hz

D. 411 Hz

Answer: A

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15. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube camn be adjusted by a variable piston.At room temperature of $37^{\circ} C$ Two successive resonances aare produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz the velocity of sound in air at $27^{\circ} C$ is

A. $330 m / s$

B. $339 m / s$

C. $300 m / s$

D. $350 m / s$

Answer: B

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EXERCISE -IA

1. Wave theory of light is not initially accepted because

A. It does not explain reflection and refraction

B. It does not explain photoelectric effect

C. It does not explain Doppler.s effect

D. It does not explain propagation of light through vacuum

Answer: D

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2. In geometrical optics a ray of light is defined as

A. Path of propagation of light

B. path of propagation os shadows

C. Direction of formation of image

D. path of propagation of energy for $\lambda \to 0$

Answer: D

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3. Select the correct option in the following.

A. Christian Huygens a contemporary of Newton established the wave theory of light by assuming that light waves were transverse

B. Maxwell provided the compelling theroretical evidence that light is transverse wave

C. Thomas Young experimentally proved the wave behavior of light and Huygens assumption

D. All the statements given above, correctly answers the question what is light

Answer: B

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4. Which of the following phenomenon is not explanined by Huygen's construction of wavefront ?

A. refraction

B. reflection

C. diffraction

D. origin of spectra

Answer: D

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5. In Newton.s corpuscular theory, no attempt was made to explain

A. the different colours of light

B. the speed of light

C. the laws of reflection

D. interference diffraction and polarization

Answer: D

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6. In the explanation of laws of refreaction by Newton.s corpuscular theory, identify the true statement

A. he assumed that light travels faster in a denser medium than in a rarer medium

B. he assumed hypothetical medium called ether, near a refracting surface

C. density of ether near the refracting surface is variable within certain range

D. light corpuscles within this range of variable density experiences no force

Answer: D

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7. Which of the following experiment proved that ..There is no ether.. in the universe

A. Foucault.s experiment

B. Lenard.s experiment

C. Michelson- Morley experiment

D. Thomson.s experimet

Answer: C

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8. The term gene for Mendellan factor was coined by

A. Newton.s corpuscular theory

B. Huygen.s wave theory

C. Electromagnetic theory

D. Quantum theory

Answer: C

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9. State the plane of polarization.

A. Newton.s corpuscular theory

B. Huygen.s wave theory

C. Electromagnetic theory

D. Quantum theory

Answer: C

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10. Choose the wrong statement

A. in isotropic medium, a ray of light is perpendicular to the wavefront

B. when the medium is anisotropic the rays are not always perpendicular to the wavefronts

C. Huygen.s theory assumed that intensity of secondary wave lets is not uniform, but varies from a maximum in forward direction to a minimum in backward direction

D. ace to Huygen.s theory the intensity of secondary wavelets is uniform in both forward and backward directions

Answer: D

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11. Assertion In refraction from a plane surface, if object is virtual, then its image will be real.

Reason Plane surface always makes opposite natured image. If object is real, then image is virtual and vice-versa.

A. phase is same for all points

B. phase changes at constant rate at all points along the surface

C. constant phase difference continuously changes between the points

D. phase changes all over the surface

Answer: A

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12. A rectangular illuminated slit produces

A. spherical wave front

B. plane wavefront

C. cylindrical wavefront

D. all the above

Answer: C

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13. Huygen.s principle is used

A. to determine the velocity of light

B. to find the position of a wave front

C. to determine the wavelength of light

D. to find the focal length of a lens

Answer: B

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14. Plane wave front is not produced by a

A. only point source of light at finite distance

B. only rectangular illuminated slit at finite distance

C. any source of light at finite distance

D. all the above

Answer: D

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15. Geometrical shadow is formed due to the phenomenon of

A. diffraction of light

B. polarisation of light

C. interference of light

D. rectilinear propapation of light

Answer: D

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16. Nature of wave front depends on

A. shape of source

B. distance of source

C. both 1 and 2

D. none of these

Answer: C

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17. When a light wave in a rarer medium is reflected from the surface of an optically denser medium, it suffers a phase change of (in radian)

A. 2π

B. $\pi/2$

C. π

D. zero

Answer: C

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18. Two waves are said to be coherent, if they have

A. different frequency, and same phase

B. same frequency, and same phase

C. same frequency, but different phase

D. different frequency, and differenct phase

Answer: B

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19. Which of the following chemical is a base analogue ?

A. two sodium vapour lamps of same power connected in parallel to the same mains

B. two identical filament bulbs connected in series to the same mains

C. two slits in an opaque screen illuminated by a monochromatic source of light

D. all the above

Answer: C

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20. A pair of coherent sources may be

A. one virtual and the other real

B. both real

C. both virtual

D. All the above

Answer: D

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21. LASER light is considered to be coherent because it consists of

A. many wavelengths

B. un coordinate wave lengths

C. co-ordinate wave of exactly the same wavelength

D. divergent beams

Answer: C

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22. Choose the correct statement

A. in the case narrow source of light coherent sources are obtained by the division of wavefront

B. in the case of narrow or extended source of light coherent sources are obtained by the division of amplitude only

C. both of the above

D. none of the above

Answer: C

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23. The transverse nature of electromagnetic waves is proved by which of the following?

A. constructive interference if the phase difference between then is 90°

B. destructive interference if the path difference between them is $\lambda/2$

C. either constructive or destructive interference only if they are of same amplitude

D. either constructive or destructive interference even though they are of different wavelengths

Answer: B

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24. Of the following which pair can be coherent sources

A. two sodium vapour lamps of same power connected in parallel to the same mains

B. two identical filament bulbs connected in series to the same mains

C. two slits in an opaque screen illuminated by a monochromatic source of light

D. all the above

Answer: C

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25. Which of the following is not a condensation polymer?

A. a source along with its virtual image in the case of Lloyd.s single mirror

B. two virtual images of the same source in the case of Fresnel.s biprism

C. Two real images of the same source as in case of Billet.s split lens

D. two sodium vapour lamps of same frequency

Answer: D

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26. To demonstrate the phenomenon of interference, we require two sources which emit radiation

A. nearly the same frequency

B. the same frequency

C. different wavelength

D. the same frequency and having a definite phase relationship

Answer: D

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27. Interference is possible in

A. longitudinal waves

B. transverse waves

C. both

D. none

Answer: C

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28. State one condition for obtaining a sustained interference of light.

A. energy is destroyed at the dark bands

B. energy is created at the bright bands

C. energy is conserved but distributed among bright and dark bands

D. all the above are true

Answer: C

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29. Colours of soap film in sun light is due to

A. dispersion

B. diffraction

C. interference

D. double refraction

Answer: C

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30. In Young.s double slit experiment sodium light is replaced by blue lamp, then the fringe width

A. increase

B. decreases

C. remains same

D. becomes zero

Answer: B

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31. In Young.s double slit experiment the band width is minimum for the colour

A. red

B. yellow

C. green

D. blue

Answer: D

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32. If interference is complete or cent percent then the frequency of observed crossover will be

A. bright fringes will be less bright and dark fringes will be less dark

B. bright fringes will be more bright and dark fringes will be more dark

C. the brightness of the bright fringes and the darkness of the dark fringes remain same

D. cannot be decided

Answer: A

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33. The graph between the separation of the slits and fringe width in Young.s double slit experiment is (assume that the distance between the source and the screen and the wavelength of the source are kept constant)

A. straight line with negative slope

B. rectangular hyperbola

C. straight line with positive slope

D. parabola

Answer: B

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34. In Young.s double slit experiment both the slits are similar. If width of one of the slits is doubled then

A. dark fringes become narrower

B. bright fringes become less bright

C. dark fringes become slightly brighter

D. bright fringes become narrower

Answer: C

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35. The contrast in the fringes in any interference pattern depends on -

A. fringe width

B. intensity ratio of the sources

C. distance between the slits

D. wavelength

Answer: B

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36. If Young.s double slit apparatus is shifted from air to water, then

A. fringe width decreases

B. fringe width increases

C. fringe width remains same

D. fringe system disappers

Answer: A

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37. After crossing two plants, the progenies are found to be male sterile. This phenomenon is found to be maternally inherited and is due to some genes which reside in

A. polarisation

B. diffraction

C. interference

D. none

Answer: C

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38. What is the difference between $2.0m$ and $2.00m$.

A. zero

B. 4π

C. 6π

D. 8π

Answer: D

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39. If one of the slits in Young's double slit experiment is fully closed, the new pattern has ----------- central maximum in angular size.

A. the central fringe is dark

B. the bright fringe nearest the central white fringe is violet

C. the bright fringe nearest the central white fringe is red

D. the fringe system is not formed

Answer: C

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40. If one of the slits in Young's double slit experiment is fully closed, the new pattern has ----------- central maximum in angular size.

A. the contrast between the bright and dark bandds decreases

B. the width of the bands decreases

C. the central band becomes dark band

D. the interference bands disappear producing uniform illumination

Answer: D

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41. Young's slit experiment establishes that

A. light consist of particles

B. light consist of waves

C. light is both particle and wave

D. none of these

Answer: B

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42. Two coherent sources S_1 and S_2 produce interference fringes. If a thin mica plate is introduced in the path of light from S_1 then the central maximum

A. shift towards S_2

B. shift towards S_1

C. do not shift to any side

D. disappear

Answer: B

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43. In Young's double slit experiment a mica sheet of thickness t and refractive index μ is introduced in the path of ray from the first source S_1 By how much distance thhe fringe pattern will be displaced.

A. $dt/D(\mu-1)$

B. $\dfrac{(\mu-1)tD}{d}$

C. $Dt\mu/d$

D. $dt\mu/D$

Answer: B

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44. When a thin metal plate is placed in the path of one of the interfering beams of light

A. the fringes become blurred

B. the fringes become brighter

C. the fringes disappear

D. the fringe width increase

Answer: C

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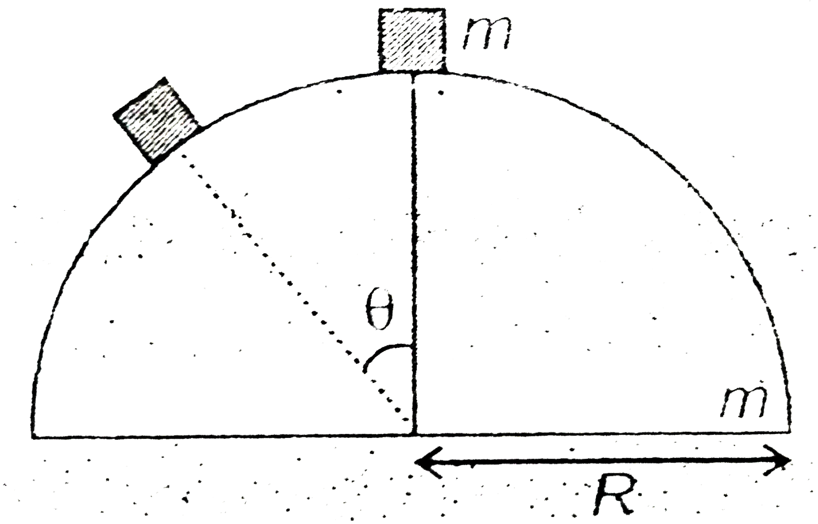
45. A particle is placed on the top of a hemispherical shell of same mass. Shell is free to move on the smooth ground.

If particle is given a given a gentle push and reaches to angular position q as shown in figure then for an observer fixed on a shell, ratio of reaction force exerted by shell to pseudo force (as observed from shell) acting on particle, is



A. straight line

B. parabola

C. hyperbola

D. circle

Answer: C

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46. If interference is complete or cent percent then the frequency of observed crossover will be

A. no interference

B. interference with bright bands

C. interference with bright bands

D. interference in which width of the fringe will be slightly increased

Answer: D

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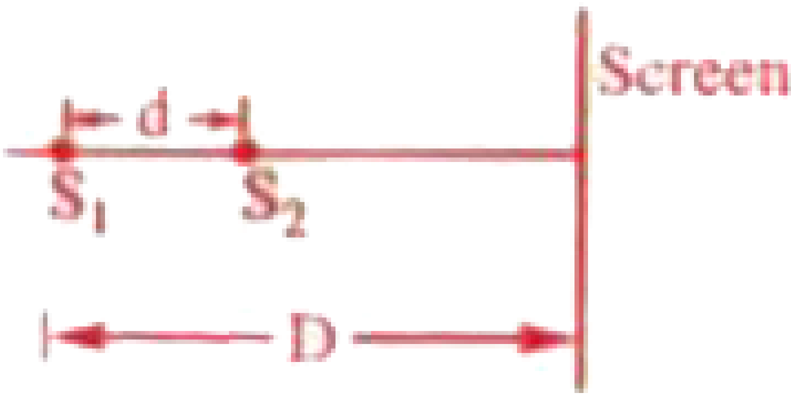
47. Two coherent sources S_1 and S_2 are separated by a small distance d. The fringes obtained on the screen will be:



A. straight lines

B. semicirles

C. concentric circles

D. points

Answer: C

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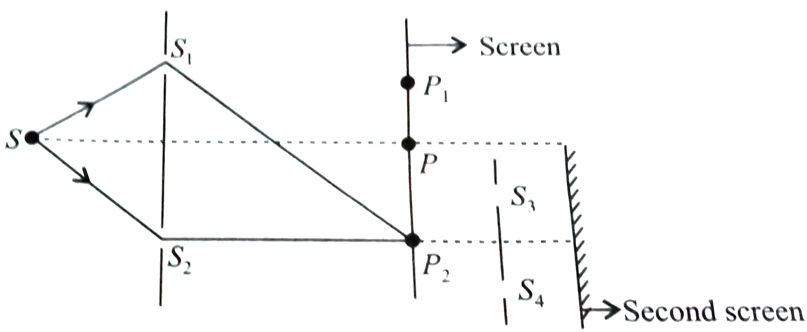
48. Figure shows a standard two slit arrangement with slits S_1, S_2. P_1, P_2 are the two minima points on either side of P. At P_2 on the screen, there is a hole and behind P_2 is a second 2 -slit arrangement with slits S_3, S_4 and a second screen behind them.



A. There would be no interference pattern on the second screen but it would be lighted

B. the second screen would be totally dark

C. the would be a single bright point on the second screen

D. there would be a regular two slit pattern on the second screen

Answer: D

Watch Video Solution

49. If the intensities of the two interfering beams in Young.s double -Slit experiment be I_1 and I_2 then the contrast between the maximum and minimum intensity is good when

A. I_1 is much greater than I_2

B. I_1 is much smaller than I_2

C. $I_1 = I_2$

D. either $I_1 = 0$ or $I_2 = 0$

Answer: C

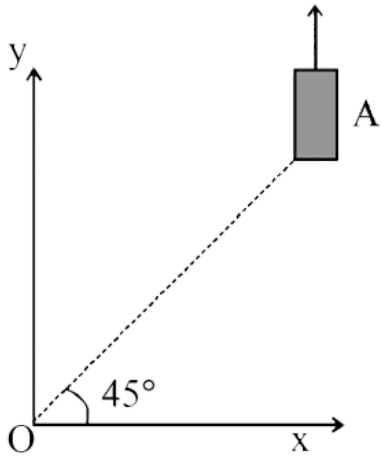
Watch Video Solution

50. On a frictionless horizontal surface, assumed to be the $x-y$ plane, a small trolley A is moving along a straight line parallel to the $y-$ axis (see figure) with a constant velocity of $(\sqrt{3}-1) m / s$. At a particular instant, when the line OA makes an angle of $45(\circ)$ with the $x-$ axis, a ball is thrown along the surface from the origin O. Its velocity makes an angle ϕ with the $x-$ axis and it hits the trolley.

(a) The motion of the ball is observed from the frame of the trolley. Calculate the angle θ made by the velocity vector of the ball with the $x-$ axis in this frame.

(b) Find the speed of the ball with respect to the surface, if

$\phi = (4\theta) / (3)$.



A. End A of screen

B. End B of screen

C. does not shift at all

D. Either end A or B depending on extra phase difference caused by shifting of source

Answer: B

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Watch Video Solution

51. If a broad source is used in interference experiment choose the incorrect statement

A. a broad source is equivalent to a large number of narrow sources lying side by side

B. each set these sources produce it.s own interference pattern which may overlap and cause general illumination

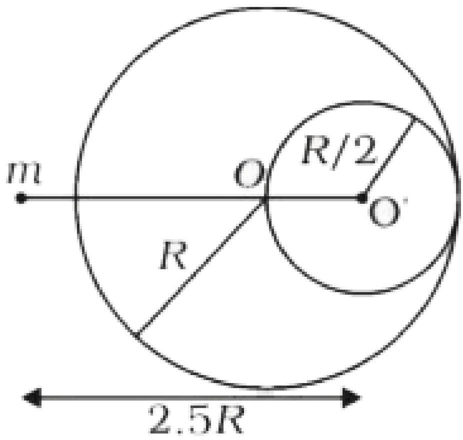
C. intensity of bright fringes increases and they become broad

D. bright and dark fringes will disappear

Answer: C

Watch Video Solution

52. A solid sphere of radius R/2 is cut out of a solid sphere of radius R such that the spherical cavity so formed touches the surface on one side and the centre of the sphere on the other side, as shown. The initial mass of the solid sphere was M. If a particle of mass m is placed at a distance 2.5R from the centre of the cavity, then what is the gravitational attraction on the mass m?



A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensities at the edges

C. a bright slit white at the centre diffusing to regions of different colour

D. only be a diffused slit white in colour

Answer: A

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53. In Young's interference experiment, the central bright fringe can be indentified due to the fact that it

A. as it has greater intensity than the other bright fringes

B. as it is wider than the othe rbright fringes

C. as it is narrower than the other bright fringes

D. by using white light instead of monochromatic light

Answer: D

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54. Three particles each of mass m are placed at the three corners of an equilateral triangle of side a. The work which should be done to increase the sides of the triangle to 2a is

A. the fringes become blurred

B. the fringes become brighter

C. the fringes disappear

D. the fringe width increase

Answer: C

Watch Video Solution

EXERCISE -IA (DIFFRACTION)

1. The phenomenon of diffraction of light was discovered by-

A. fresnel

B. fraunhofer

C. young

D. grimaldi

Answer: D

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2. What is meant by diffraction of light?

A. the bending of light at the surface of separation when is travels from rarer medium to denser medium

B. the bending of light at the surface of separation when is travels from denser medium to rarer medium

C. encroachment of light into the geometrical shadow of the obstacle placed in its path

D. emergence of a light ray grazing the surface of separation when it travels from denser to rarer medium

Answer: C

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3. Both light and sound waves suffer diffraction. Why it is more difficult to observe diffraction with light waves?

A. light wave do not require medium

B. wavelength of light waves is far smaller

C. light waves are transverse

D. speed of light is far greater

Answer: B

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4. The silver lining surrounding the profile of a mountain just before sunrise is due to

A. interference

B. diffraction

C. dispersion

D. refraction

Answer: B

Watch Video Solution

5. When a compact disc is illuminated by a source of white light,colured lines are observed.This is due to

A. dispersion

B. diffraction

C. interference

D. refraction

Answer: B

Watch Video Solution

6. Which of the following statements is correct

A. diffraction is because of interference of light from same source where as interference is due to light from two individual sources

B. diffraction pattern is due to interference of light from secondary waves of the same wave front whereas interference is due to superposition of two waves derived from the same source

C. diffraction is due to interference of light waves derived from the same source whereas interference is bending of light at the obstacle

D. none of the above

Answer: B

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7. Bright colours exhibited by spider.s web, exposed to sunlight are due to

A. interference

B. resolution

C. diffraction

D. polarisation

Answer: C

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8. A plane wavefront is divided into a number of half period zones as per Fresnel theory. The resultant amplitude at a point due to secondary waves spreading from a zone is

A. directly porportional to the square root of the area of the zone

B. inversely proportional to the square of the distance of the point from the zone

C. inversely proportional to the distance of the point from the zone

D. independence of obliquity

Answer: C

Watch Video Solution

9. Which element is the lightest of all other solid elements ?

A. increase

B. decreases

C. remains same

D. may increase or decrease depending upon the wavelength

Answer: B

Watch Video Solution

10. Two point sources of sound are kept at a separation of 10 cm. They vibrate in phase to produce waves of wavelength 5.0 cm. What would be the phase difference between the two waves arriving at a point 20 cm from one source (a) on the line joining the sources and (b) on the perpendicular bisector of the line joining the sources ?

A. $\pi/2$

B. $\pi/4$

C. π

D. zero

Answer: C

Watch Video Solution

11. When a beam of light is used to determine the position of an object, the maximum accuracy is achieved if the light is

A. polarised

B. of longer wave length

C. unpolarised

D. of shorter wave length

Answer: B

Watch Video Solution

12. In Fresnel.s diffraction wavefront must be

A. spherical

B. cylindrical

C. plane

D. both 1 and 2

Answer: D

Watch Video Solution

13. The source is at some distance from an obstacle. Distance between obstacle and the point of observation is .b. and wavelength of light is . λ. . Then the distance of nth

Fresnel Zone will be at a distance..........from the point of observation.

A. $\frac{bnl}{2}$

B. $b - \frac{n\lambda}{2}$

C. $b + \frac{n\lambda}{2}$

D. $b - n\lambda$

Answer: C

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14. A very small opaque disc is placed in the path oa a monochromatic light. Its geometric shadow has

A. bright point at the center of shadow surrounded by alternate bright and dark rings

B. dark point at the center of shadow surrunded by alternate bright and dark rings

C. uniform darkness

D. uniform illumination

Answer: A

Watch Video Solution

15. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light?

A. no change

B. diffraction bands become narrower and crowded together

C. bands become broader and farther apart

D. bands disappear

Answer: B

Watch Video Solution

16. In a diffraction pattern the width of any fringe is

A. directly proportional to slit width

B. inversely proportional to slit width

C. independent of the slit width

D. inversely proportional to square of slit width

Answer: B

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17. Yellow light is used in a single slit diffraction experiment with a slit of 0.6 mm. If yellow light is replaced by x-rays, than the observed pattern will reveal:

A. the the central maximum is narrower

B. more number of fringes

C. less number of fringes

D. no diffraction patterns

Answer: D

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18. In diffraction froma a single -slit, the angular width of the centre maxima does not depends on

A. λ of light used

B. width of slit

C. distance of slits from the screen

D. ratio of λ and slit width

Answer: C

Watch Video Solution

19. The correct relation between limit of resolution and resolving power is

A. limit of resolution $= \frac{1}{\text{resolving power}}$

B. limit of resolution α resolving power

C. limit of resolution $\alpha = \frac{1}{\text{resolving power}}$

D. limit of resolution α (1- resolving power)

Answer: A

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20. The resolving power of electron microscope is

A. 400 times

B. 40 times

C. 4000 times

D. 4 times

Answer: C

Watch Video Solution

21. The limit of resolution of eye is approximately

A. 1^{11} angle

B. 1^{1} angle

C. 1 mm

D. 1 cm

Answer: B

Watch Video Solution

22. The angular resolution of the telescope is determined by the

A. image produced by the telescope

B. objective of the telescope

C. both 1 and 2

D. neither 1 or 2

Answer: B

Watch Video Solution

23. In telescope of objective diameter (2a), the radius of the central bright region (r_0) is

A. $\frac{0.61\lambda f}{a}$

B. $\frac{0.75\lambda f}{a}$

C. $\frac{1.94\lambda f}{a}$

D. $\frac{2.43\lambda f}{a}$

Answer: A

Watch Video Solution

24. For better resolution, a telescope must have a

A. large diameter objective

B. small diameter objective

C. may be large

D. neither large nor small

Answer: A

Watch Video Solution

25. What will be ratio (D/f) in microscope where, D is the diameter of the aperture and .f. is the focal length of the objective lens?

A. $\tan\beta$

B. $\dfrac{\tan(\beta)}{2}$

C. $2\tan\beta$

D. $\dfrac{\tan(\beta)}{6}$

Answer: C

Watch Video Solution

26. The resolving power of a microscope is basically determined by the

A. speed of the light used

B. wavelength of the ligth used

C. both 1 and 2

D. neither 1 or 2

Answer: B

Watch Video Solution

27. If the red light is replaced by blue light illuminating the object in a microscope, then the resolving power of the microscope

A. A) decreases

B. B) increases

C. C) gets halved

D. D) remains unchanged

Answer: B

Watch Video Solution

28. For a telescope to have large resolving power, then the

A. focal length of its objective should be large

B. focal length of its eye piece should be large

C. focal length of its eye piece should be small

D. aperture of its objective should be large

Answer: D

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29. If I_0 is the intensity of the pricipal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled ?

A. $2I_0$

B. $4I_0$

C. I_0

D. $I_0/2$

Answer: B

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30. In an experiment, a physical quantity is given by $Y = \frac{a^2 b}{c^3}$. The permissible percentage error

A. $Z_F \approx \lambda/a^2$

B. $Z_F \approx 2\lambda/a^2$

C. $Z_F \approx a^2/\lambda$

D. $Z_F \approx /\lambda$

Answer: C

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31. The diffraction pattern due to a straight edge contains

A. alternate bright and dark bands of same width

B. alternate bright and dark bands with decreasing width as the order of the band increases in the illuminated part

C. alternate bright and dark bands with increasing width as the order of the band increases

D. none of the above is true

Answer: B

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32. As we move away from the edge into the geometrical shadow of a straight edge, the intensity of illumination

A. decreases

B. increases

C. remains same

D. none of the above

Answer: A

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33. In the case of diffraction bands due to a straight edge, as we move away from the edge

A. intensity of the bright band increases and that of the dark band decreases

B. intensity of the bright band decreases and that of the dark band increases

C. intensity of the bright band decreases but that of the dark band remains unchanged

D. intensity of the bright band remains unchanged but that of the dark band increases

Answer: B

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EXERCISE -IA (POLARASATION)

1. Transverse wave nature is established by

A. interference

B. diffraction

C. polarisation

D. all the above

Answer: C

Watch Video Solution

2. Transverse wave nature of light was first proposed by

A. Huygen

B. fraunhofer

C. maxwell

D. fresnel

Answer: C

Watch Video Solution

3. Which of the following cannot be polarised?

A. radio waves

B. X-rays

C. ultra violet rays

D. sound waves

Answer: D

Watch Video Solution

4. Which of the following phenomenon is not common to sound and light waves

A. interference

B. diffraction

C. polarisation

D. reflection

Answer: C

Watch Video Solution

5. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarization is

A. zero

B. 45°

C. 90°

D. 180°

Answer: A

Watch Video Solution

6. In the case of light waves the angle between plane of vibration and plane of polarization is

A. 180°

B. 90°

C. 45°

D. zero

Answer: D

Watch Video Solution

7. Polarisation can be produced by

A. reflection

B. double refraction

C. scattering

D. all of the above

Answer: D

Watch Video Solution

8. In the case of linearly polarized light, the magnitude of he electric field vector

A. is parallel to the direction of propagation

B. does not change with time

C. increases and decreases linearly with time

D. varies periodically with time

Answer: D

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9. Which of the following represents a volt?

A. $y(x, t) = a \sin(kx - \omega t)$

B. $z(x, t) = a \sin(kx - \omega t)$

C. $z(x, t) = a \sin(kx - \omega t + \phi)$

D. both 2 and 3

Answer: D

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10. The tangent of polarizing angle is numerically equal to

A. diversity of the reflecting medium

B. refractive index of the reflecting medium

C. velocity of light in reflecting medium

D. elastic modulus of reflecting medium

Answer: B

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11. Ordinary light is incident on the upper surface of a glass slab at theh polarizing angle. Then

A. the reflected ray is completely plane polarized with vibrations perpendicular to the plane of incidence

B. the refracted ray is also completely plane polarized with vibrations in the plane of incidence

C. the reflected ray is partically polarized with vibrations perpendicular to the plane of incidence

D. both reflected and refracted rays are completely polarized having both of them vibrations in the plane of incidence

Answer: A

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12. Ordinary (i.e., unpolarised) lights is incident on the surface of a transparent material at the polarising angle. If it is partly reflected and partly refracted, what is the angle between the reflected and the refracted rays?

A. parallel to each other

B. perpendicular to each other

C. inclined to each other making an angle 45°

D. none of the above

Answer: B

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13. A calcite crystal placed over an ink dot is rotated. On seeing through the crystal one finds

A. two stationary dots

B. two dots moving along parallel straight lines

C. one dot rotating about the other

D. both dots rotating about a common axis

Answer: C

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14. When unpolarized light is incident on a Tourmaline crystal of proper thickness

a) it exhibits dichroism

b) it absorbs ordinary ray and transmits extraordinary ray

c) it absorbs extraordinary ray and transmits ordinary ray.

A. O-ray is completly absorbed and E-ray is partially absorbed

B. O-ray is partially absorbed and E-ray is completly absorbed

C. Both O-ray & E-ray is completly absorbed

D. Both O-ray & E-ray is partially absorbed

Answer: A

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15. The refractive index of the material of the prism and liquid are 1.56 and 1.32 respectively. What will be the value of θ for the following refraction ?

A. only the O-ray is polarised

B. only the E-ray is polarised

C. both O-ray and E-ray are polarised

D. neither 0-ray nor E-ray are polarised

Answer: C

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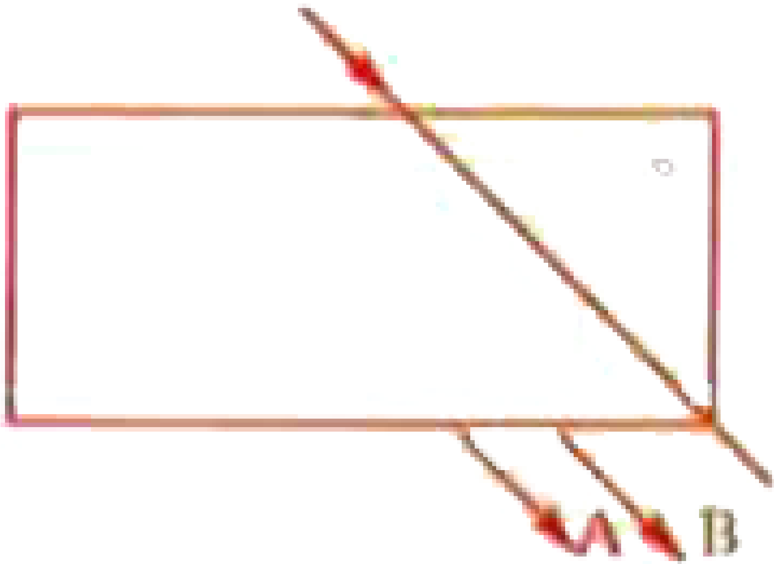
16. A double refracting crystal plate gives two refracted rays A and B for a single incident ray as shown. If μ_A and

μ_B are the refractive indices of the crystal for the two rays



A. $\mu_A > \mu_B$

B. $\mu_A = \mu_B$

C. $\mu_A < \mu_B$

D. none

Answer: A

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Watch Video Solution

17. Which of the following is wheat fruit?

A. quartz

B. crown glass

C. tourmaline

D. all the above

Answer: C

Watch Video Solution

18. Dichroism is the property where

A. unequal absorption of ordinary and extraordinary rays takes place

B. equal absorption of ordinary and extraordinary rays takes place

C. plane of polarization rotates

D. none of the above

Answer: A

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19. If a ray of light is allowed to pass through a quartz crystal, then the two refracted rays obtained are

A. plane polarized and planes of polarization are parallel

B. plane polarized and planes of polarization are perpendicular

C. circularly polarized in opposite direction

D. circularly polarized in the same direction

Answer: B

Watch Video Solution

20. Which of the folloiwng is dichroic

A. poly vinyl alcohol

B. quartz

C. calcite

D. diamond

Answer: A

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21. The intensity of the polarized light transmitted through the analyzer is given by

A. Brewster.s law

B. Malus law

C. Fresnel.s assumption

D. Law of superposition

Answer: B

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22. A plane polarized light is incident on an analyser and when it is rotated to complete one rotation, one observes

A. one extinction and two brightnesses

B. one brightness and two extinctions

C. two extinctions and two brightnesses

D. no change in the brightness

Answer: C

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23. When light falls on two polaroid sheets having their axies matually perpendicular, then it is

A. completly extinguished

B. partly extinguished

C. partly brightnessed

D. completely brightnessed

Answer: A

Watch Video Solution

24. Polaroids are used

A. A. to eliminate head light glare in automobile

B. B. in production of 3-D motion pictures

C. C. in sun glasses

D. D. all the above

Answer: D

Watch Video Solution

25. The synthetic material used for the preparation of polaroids prosses the propery of

A. anomalous thermal expansion

B. optical activity

C. dichroism

D. none of the above

Answer: C

Watch Video Solution

26. If polaroids are to be used to avoid glares of in coming light then

A. visibility will decrease

B. transmittivity of windshield will decrease

C. vehicles will move slowly

D. cost will increase

Answer: A

Watch Video Solution

27. When light falls on two polaroid sheets, one observes complete brightness then the two polaroids axes are

A. mutually perpendicular

B. mutually parallel

C. angle between their two axes is 45°

D. none of the above

Answer: B

Watch Video Solution

28. Choose the correct statement.

A. The maximum intensity in the interference pattern of Young"s double slit experiment is four times the intensity of the individual wave

B. in the diffraction pattern due to straight edge the intensity of the bright bands in the illuminated part increases with the increase of the order of the band

C. during double refraction the vibrations of the extra-ordinary ray are perpendicular to the principal section of the crystal

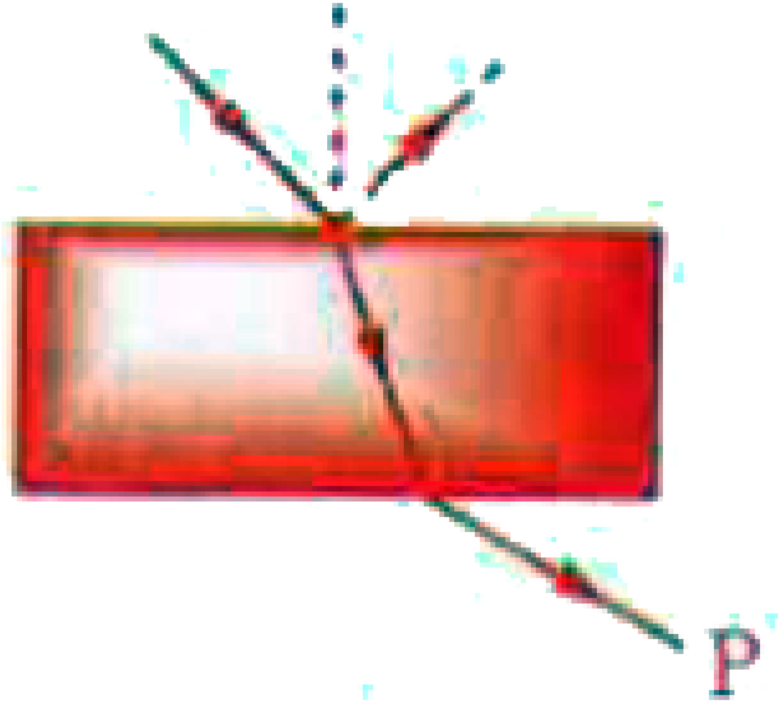
D. light waves can be polarized because they are longitudinal waves

Answer: A

Watch Video Solution

29. Consider is light beam incident from air to a glass slab at

Brewster.s angle as shown in Fig.



A Polaroid is placed in the path of the emergent ray at point P and rotated about an axis passing through the centre and perpendicular to the plane of the polaroid.

A. For a particular orientation, there shall be darkness as observed through the Polaroid

B. The intensity of light as seen through the polaroid shall be independent of the rotation

C. The intensity of light as seen through the polaroid shall go through a minimum but not zero for two orientations of the polaroid

D. The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid

Answer: C

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EXERCISE -IA (SATEMENT TYPE QUESTIONS)

1. Consider the following statement A and B and identify the correct answer

A) In the case of narrow source of light coherent sources are obtained by the division of wave front

B) Diffraction is due to interference of light from secondary sources of the same wave front whereas interference is due to superposition of two waves derived from the same source.

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

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2. Instead of using two slits as in young.s experiment, if we use two separate but identical sodium lamps, which of the following occur

a) uniform illumination is observed

b) widely separate interference

c) very bright maximum

d) very minimum.

A. a only

B. a, b only

C. c, d only

D. b, d only

Answer: A

Watch Video Solution

3. Consider the following statement A and B and identify the correct answer

A) In the case of narrow source of light coherent sources are obtained by the division of wave front

B) Diffraction is due to interference of light from secondary sources of the same wave front whereas interference is due to superposition of two waves derived from the same source.

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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4. Consider the following statement A and B and identify the correct answer

A) Radio waves diffract around buildings but light waves does not

B) To cut down glare of incident light we prefer sun glasses made from polaroids

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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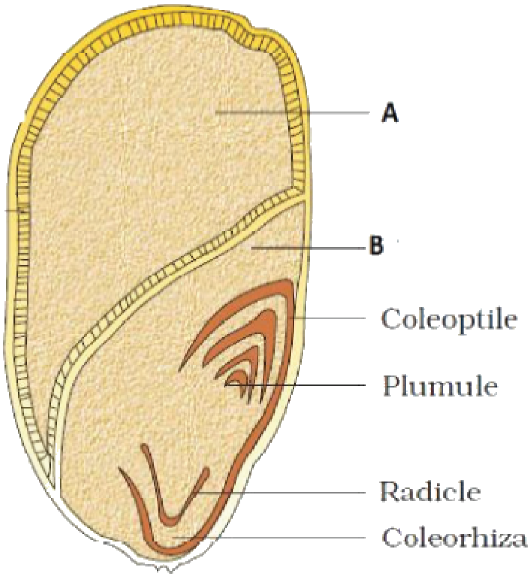
5. In the following diagram label A and B



A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

6. Consider the following statement A and B and identify the correct answer

A) Fresnel.s diffraction pattern occurs when the source of light or the screen on which the diffraction pattern is seen or when both are at finite distance from the aperture

B) Diffraction light can be used to estimate the helical structure of nucleic acids

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

Watch Video Solution

7. Consider the following statement A and B and identify the correct answer

A) Electric vector of electromagnetic wave is the light vector that affects the retina of the eye

B) In a polarized light the sum of all the components of the vibrations in one direction is eaqul to the sum of all the components of the vibrations perpendicular to that direction

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: B

Watch Video Solution

8. Consider the following statement A and B and identify the correct answer

A) When light falls on two polariod sheets having their axes mutually perpendicular it is completely extinguished

B) When polyvinyl alcohol is subjected to a large strain the molecules get oriented parallel to the direction of strain and material becomes double refractive

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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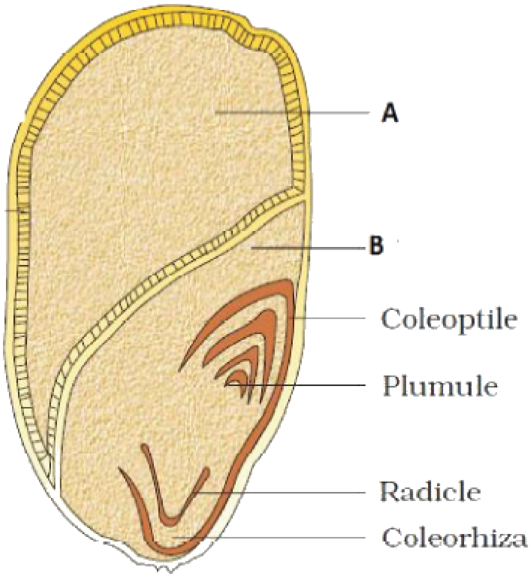
9. In the following diagram label A and B



A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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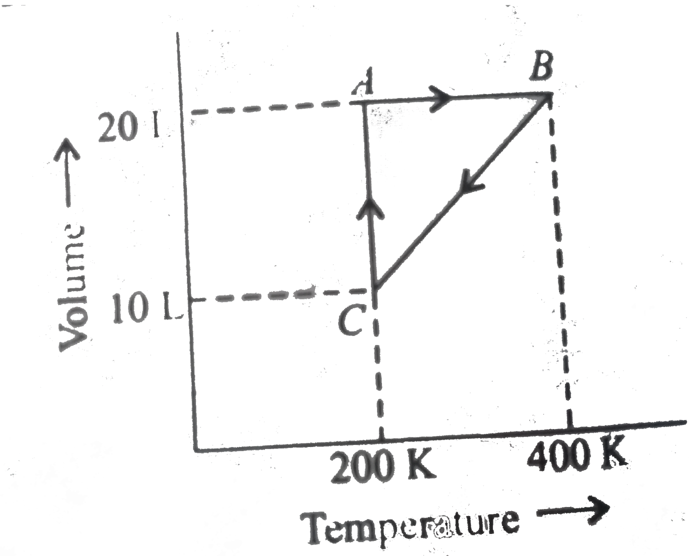
10.



The pressures at A and B in the atmosphere are, respectively,

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

Watch Video Solution

11. In a reaction, ΔH and ΔS both are more than zero. In which of the following cases, the reaction would not be spontaneous?

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: C

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12. A man in a lift ascending with an upward acceleration a throws a ball vertically upwards with a velocity v with respect to himself and catches it after t_1 seconds. After wards when the lift is descending with the same acceleration a acting downwards the man again throws the ball vertically upwards with the same velocity with respect to him and catches it after t_2 seconds?

A. A is false but B is true

B. A is true but B is false

C. Both A and B are true

D. Both A and B are false

Answer: A

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EXERCISE -IA (MORE THAN ONE OPTION)

1. In which of the following cases do we obtain a spherical wave fron ?

a) sunlight focussed by a convex lens

b) light diverging from a straight slit

c) light emitted by a point source in an isotropic medium

d) a parallel beam of light reflected from a plane mirror

A. a, b only

B. b, c only

C. a, d only

D. a, c only

Answer: D

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2. Huygen.s principle of secondary wavelets can be used to

a) deduce the laws of rectraction of light

b) deduce the laws of refraction of light

c) explain the transverse nature of light waves

d) predict the location of a wavefront as time passes

A. a, b only

B. a, c only

C. a, b, d only

D. b, c only

Answer: C

Watch Video Solution

3. When two coherent waves interfere, the minimum and maximum intensities are in the ratio 16 : 25. Then

a) the maximum and minimum amplitudes will be in the ratio 5 : 4

b) the amplitudes of the individual waves will be in the ratio 9 : 1

c) the intensities of the individual waves will be in the ratio 41 : 9

d) the intensities of the individual waves will be in the ratio 81 : 1.

A. a, b and c are true

B. a, b and d are true

C. a and b are true

D. b and c are true

Answer: B

Watch Video Solution

4. If white light is used in Young's double -slit experiment

a) bright white fringe is formed at the centre of the screen

b) fringes of different colours are observed on both sides of central fringe clearly only in the first order

c) the first order violet fringes are closer to the centre of the screen than the first order red fringes

d) the first order red fringes are closer to the centre of the screen than the first order violet fringes

A. only a and d are true

B. only a and b are true

C. only a, b and c are true

D. all are true

Answer: C

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5. Both in interference and diffraction phenomena, alternate dark and bright fringes are obtained on screen

I) generally fringe width is same in interference and not same in diffraction

II) the central fringe in interference has maximum brightness and the intensity gradually decreases on either side

III) in interference the intensity of all bright fringes is same

IV) both the phenomena are produced from same coherent sources.

A. I only

B. I and II

C. I, II and IV

D. I, III and IV

Answer: D

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6. In Young.s double slit experiment, the 10th bright fringe is at a distance x from the central fringe. Then

a) the 10th dark fringe ia at a distance of $19x/20$ from the central fringe

b) the 10th dark fringe is at a distance of $21x/20$ from the central fringe.

c) the 5th dark fringe is at a distance of $x/2$ from the central fringe. d) the 5th dark fringe is at a distance of $9x/20$ from the central fringe.

A. a, b, c only

B. b, c, d only

C. a, d only

D. a, b, c, d only

Answer: C

Watch Video Solution

7. A light of wavelength 1 is incident on an object of size b. If a screen is at a distance D from the object, identify the correct condition for the obervation of different phenomena

a) if $b^2 = D1$, Fresnel diffration is obserbed

b) if $b^2 > > D1$, Fraunhofer diffraction is obserbed

c) if $b^2 < < D1$, Fraunhofer diffraction is obserbed

d) if $b^2 > > D1$, the approximation of geometrical optics is applicable

A. a, b and d are true

B. a, c and d are true

C. a and c are true

D. a and d are true

Answer: B

Watch Video Solution

8. Consider sunlight incident on a pinhole of width 10^3Å.

The image of the pinhole seen on a screen shall be

A. only ..a.. is true

B. only ..b.. and ..d.. are true

C. only ..c.. and ..d.. are true

D. only ..b.. and ..c.. are true

Answer: B

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9. In a single slit diffraction experiment, the width of the slit is made double its original width. Then the central maximum of the diffraction pattern will become

A. a, d only

B. b, c only

C. c, d only

D. b, d only

Answer: A

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10. Consider the diffraction pattern for a small pinhole. As the size of the hole is increased

A. only ..a.. and ..b.. are correct

B. only ..a.. and ..d.. are correct

C. only ..c.. and ..d.. are correct

D. all are true

Answer: A

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11. For light diverging from a point source :

a) the wavefront is spherical

b) the intensity decreases in proportion to the distance squared

c) the wavefront is parabolic

d) the intensity at the wavefront does not depend on the distance

A. only ..a.. and ..b.. are correct

B. only ..a.. and ..d.. are correct

C. only ..c.. and ..d.. are correct

D. all are true

Answer: A

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12. When light is polarised by reflection from a transparent surface.

a) reflection and refracted rays are mutually perpendicular

b) both reflected and refracted rays are plane polarised

c) refraction ray is partially polarised

d) the R.I., of transparent surface is equal to tangent of Brewster.s angle

A. only a and c are true

B. only b, c and d are true

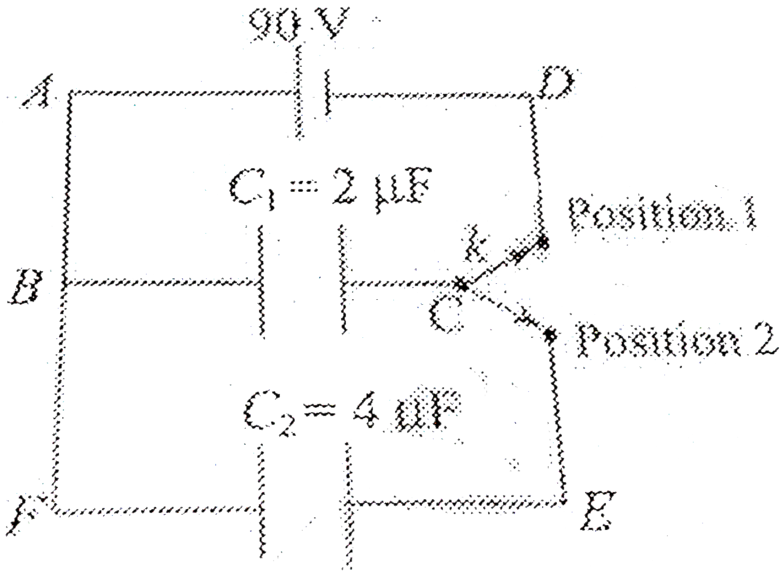
C. only a, c and d are true

D. only a and d are true

Answer: C

Watch Video Solution

13. Figure shows two capacitors of capacitance $2\mu F$ and $4\mu F$ and a cell of 90 V. The switch 'k' is such that when it is in position 1, the circuit ABCD is closed and when it is in position 2, the circuit BCEF is closed.the resistance of both the circuits is negligible os that the capacitor gets fully charged instantly. Initially the switch is in position1. then it is turned in position 2 and then in position 1. Now two cycles are completed. Find the charge $(\text{in}\mu C)$ after two cycles.



A. only a and b are true

B. only a and c are true

C. only b and c are true

D. all are true

Answer: A

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14. Which of the following statements is/are correct?

I) a polaroid of long chain molecules aligned in a particular direction

II) electric vectors along the direction of the aligned molecules in a polaroid gets absorbed

III) an unpolarised light wave is incident on polaroid, then it will get linearly polarized.

A. only I

B. both II and III

C. only III

D. only III I, II and III

Answer: D

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EXERCISE -IA (MATCHING TYPE QUESTIONS)

1. List - I List -II

a) spherical wave front e) location of new wave front

b) plane wave front f) line source

c) cylindrical wave front g) point source at finite distance

d) Huygen's principle h) point source at infinite distance

A. $A-G, B-H, C-F, D-E$

B. $A-H, B-G, C-F, D-E$

C. $A-H, B-G, C-E, D-F$

D. $A-H, B-G, C-F, D-E$

Answer: A

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2. List-I List-II

a) Fresnel's diffraction e) Bright band

b) Fraunhofer's diffraction f) Source and screen are at finite distance

c) In interference phase difference is even multiple of π g) Dark band

d) In interference phase difference is odd multiple of π h) Source and screen are at infinite distance

A. $A - F, B - H, C - E, D - G$

B. $A - E, B - G, C - F, D - H$

C. $A - H, B - F, C - E, D - G$

D. $A - F, B - H, C - G, D - E$

Answer: A

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3. List-I List-II

a) Einstein e) velocity of light

b) Huygen f) diffraction of light

c) Focault g) wave nature of light

d) Fresnel h) particle nature of light

A. $A-H, B-G, C-F, D-E$

B. $A-G, B-H, C-E, D-F$

C. $A-H, B-G, C-E, D-F$

D. $A-G, B-H, C-F, D-E$

Answer: C

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4. List-I List-II

a) interference e) transverse nature of light

b) diffraction f) unequal absorption of ordinary and extraordinary ray

c) polarization g) bands of equal width

d) dichroism h) bands of unequal width

A. $A - F, B - G, C - H, D - E$

B. $A - H, B - G, C - F, D - E$

C. $A - E, B - F, C - G, D - H$

D. $A - G, B - H, C - E, D - F$

Answer: D

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5. List-I List-II

a) interference e) transverse nature of light

b) diffraction f) unequal absorption of ordinary and extraordinary ray

c) polarization g) bands of equal width

d) dichroism h) bands of unequal width

A. $A-G, B-H, C-F, D-E$

B. $A-H, B-G, C-E, D-F$

C. $A-G, B-E, C-F, D-H$

D. $A-E, B-F, C-H, D-G$

Answer: C

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6. Define the following with reference to refraction of light.

(a) incident ray, (b) refracted ray (c) normal,

(d) emergent ray, (e) angle of incidence, (br> (f) angle of refraction.

A. $A-H, B-E, C-F, D-G$

B. $A-H, B-F, C-G, D-E$

C. $A-H, B-G, C-E, D-F$

D. $A-G, B-H, C-F, D-E$

Answer: B

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EXERCISE -IA (ASCENDING AND DSCENDING ORDER TYPE QUESTIONS)

1. Young.s experiment is performed in air, water and glass. The descending order of fringe width for these media is

A. water, air, glass

B. glass, water, air

C. air, water, glass

D. glass, air water

Answer: C

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2. The young.s double slit experiment is performed with four different sources. The number of fringes observed in a given region for that sources are $n_1 = 100, n_2 = 60, n_3 = 150, n_4 = 120$. The descending order of wave lengths of sources is

A. n_4, n_2, n_3, n_1

B. n_4, n_2, n_3, n_1

C. n_4, n_2, n_3, n_1

D. n_4, n_2, n_3, n_1

Answer: B

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3. Arrange the ascending order of polarising angles for air-glass, air-water, and water-glass interfaces?

A. water-glass, air-water, air-glass

B. air-water, air-glass, water-glass

C. air-glass, air-water, water-glass

D. air-water, water-glass, air-glass

Answer: A

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4. Two beams of light having intensities 9I and 4I interfere to produce fringe pattern on a screen P, Q and R are three points on the screen at which the phase differences between the interfering beams are $30^\circ, 45^\circ$ and 60° and the intensities are I_P, I_Q and I_R respectivley.

Arrange the diffrence between the intensities in ascending order

A. $(I_P - I_Q), (I_P - I_R), (I_Q - I_R)$

B. $(I_P - I_Q), (I_Q - I_R), (I_P - I_R)$

C. $(I_P - I_R), (I_Q - I_R), (I_P - I_Q)$

D. $(I_Q - I_R), (I_P - I_Q), (I_P - I_R)$

Answer: B

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5. The critical angles of three transpararent media K, L & M are $30^\circ, 60^\circ$ and 45° respectively. If K_P, L_P and M_P

are their polarising angles respectively, arrange them in increasing order

A. K_P, L_P, M_P

B. M_P, L_P, K_P

C. L_P, M_P, K_P

D. K_P, M_P, L_P

Answer: C

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6. Four transparent slabs having thickness $t_1 = 2cm, t_2 = 4cm, t_3 = 3cm$ and $t_4 = 5cm$ are introduced in one of the paths of light emitted by two narrow slits the ascending order of shift of the central fringe

A. t_1, t_2, t_3, t_4

B. t_4, t_3, t_2, t_1

C. t_3, t_2, t_4, t_1

D. t_1, t_3, t_2, t_4

Answer: D

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EXERCISE -IB (ASSERTION AND REASON)

1. A current I amperes flows through a loop abcdefgha along the edge of a cube of width l metres as shown in figure. One corner 'a' of the loop lies at origin.

Thish current path (abcdefgha) can be treated as a superposition of three square loops carrying current I. Choose the correct option?

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

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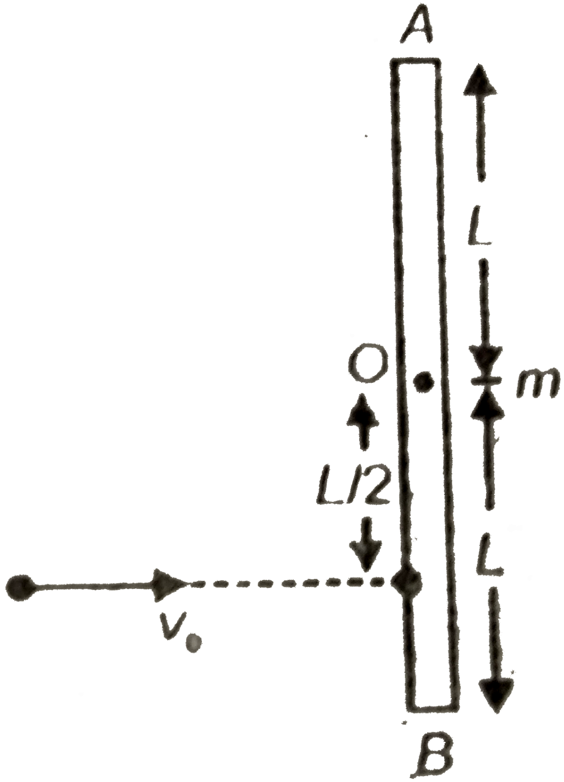
2. A rod AB of length $2L$ and mass m is lying on a horizontal frictionless surface. A particle of same mass m travelling along the surface hits the rod at distance $\frac{L}{2}$ from COM with a velocity v_0 in a direction perpendicular to rod and sticks to it.



Distance of point P on rod from B which is at rest immediately afte collision is

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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3. A : Universe is expanding

R : There is red shift in the spectra of galaxies

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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4. A : More accurate formula for the Doppler effect which is valid when the speeds close to that of light, requires the used of Einsteins special theory or relativity.

R : Doppler effect is the basis for the measurements of the raidal velocities of distant galaxies.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

5. A : The geometrical shape of the wave front when a wavefront passes through a convex lens will be again plane wave front

R : Whne a plane wave front is reflected by a concave mirror, it remains as plane wavefront.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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6. A : The direction of a light is always perpendicular to wavefront

R : A ray of light is a line perpendicular to a wavefront in the direction of propagation.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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7. A : Light from two coherent sources is reaching the screen. If the path difference at a point on the screen for yellow light is $3\lambda/2$, then the fringe at the point will be coloured.

R : Two coherent sources always have same phase relationship at any point on the screen.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

8. Statement-1: No interference pattern is deterced when two coherent sources are infinitely close to each other.

Statement-2: The fringe width is inversely proportional to the distance between the two slits.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

9. A : Interference obey is the law of conservation energy.

R : The energy is redistributed in case or interference.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

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10. A : In interference, the fringe obtained at the centre of the screen is known as zeroth order fringe, or the central fringe

R : In interference, path difference between the waves from

S_1 and S_2, reaching the central fringe (or zero order fringe) is zero

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

11. A : If the phase difference between the light waves emerging from the slits of the Young.s experiment is π-raidan, the central fringe will be dark

R : Phase difference is equal to $(2\pi/\lambda)$ times the path difference.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

12. A : In Young.s double slit expriment the band width for red colour is more

R : Wavelength of red is small among the colours of white light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

13. A : In Young.s interference experiment the incident light used is white. When one slit is convered with red filter and the other with blue filter, the phase difference at any point on the screen will continuously change and producing uniform illumination.

R : Two independent sources of light would no longer act as coherent sources.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

14. A : If the whole apparatus of Young.s experiment is immersed in liquid, the fringe width will decrease.

R : The wavelength of light in water is more than that in air.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

15. A : In Y.D.S.E., if distance of screen (D) is very large compared to the fringe width, the fringes will be very nearly straight lies.

R : In general, the shape of fringes formed in Y.D.S.E is hyperbola.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

16. A : Light added to light can produce darkness.

R : The destructive interference of two coherent light sources may give dark fringe.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

17. A : In Young.s double slit experiment, we observe an interference pattern on the screen if both the slits are illuminated by two bulbs of same power.

R : The interference pattern is obserbed only when source are monochromatic.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

18. A : Young.s double slit experiment can be performed using a source of white light.

R : The wavelength of red light is less than the wavelength of other colours in white light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

19. A : For best contrast between maxima and minima in the interference pattern of Young.s double slit experiment, the intensity of light emerging out of the two slits should be equa.

R : The intensity of interference pattern is proportional to square of amplitude.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

20. A : In Young.s double slit experiment, the fringes become indistinct if one of the slits is covered with cellophane paper.

R : The cellophane paper decrease the wavelength of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

21. A : When a light wave travels from a rarer to a denser medium, it looses speed. The reduction in speed imply a reduction in energy carried by the light wave.

R : The energy of a wave of proportional to frequency of wave.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

22. Assertion The pattern and position of fringes always remain same even after the introduction of transport medium in a path of one of the slit

Reason The central fringe is bright or dark depends upon the initial phase difference between the two coherence sources.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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23. A : Y.D.S.E, as the source slit width increases, fringe pattern gets less and less sharp.

R : When the source slit is so wide that the condition $\frac{s}{S} < \frac{\lambda}{d}$ is not satisfied, the interference pattern is appears.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

24. A : For interference fringes to be seen, the condition $\frac{s}{S} < \frac{\lambda}{d}$ should be satisfied. Where .s. be the size of source slit, S is its distance from plane of two slits and .d. is the distance between two slits.

R : In Y.D.S.E, if distance of source slit from the two slits (s) decreases, the interference pattern gets more sharp.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

25. Statement-1: In Young's double slit experiment the two slits are at distance d apart. Interference pattern is observed on a screen at distance D from the slits. At a poit on the screen when it is directly opposite to one of the slits, a dard fringe is observed then the wavelength of wave is proportional of square of distance of two slits.

Statement-2: In Young's double slit experiment, for identical slits, the intensity of a dark fringe is zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

26. A : When the coherent sources are far apart, interference pattern cannot be detected.

R : If two point coherent sources are infinitely close to each other, firinges appears very sharp.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

27. Assertion : When a thin transparent sheet is placed in front of both the slits of Young's experiment, the fringe width will remains same.

Reason : In Young's experiment, the fringe width is directly proportional to wavelength of the source used.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

28. A : The soap film in sun light is colourful.

R : Thin films produce interference of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

29. A : Thin films such as soap bubble or a thin layer of oil on water show beautiful colours when illuminated by sunlight.

R : The colours are obtained by dispersion of light only.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

30. Assertion:- Newton's rings are formed in the reflected system. When the space between the lens and the glass place is filled with a liquid of regractive index greater than that of glass, the central spot of the pattern is bright.

Reason:- This is because the reflection in these cases will be from a denser to raer medium and the two interfering rays are reflected under similar conditions.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

31. Assertion (A) : The film which appears bright in reflected system will appear dark in the transmitted system and vice-versa.

Reason (R) : The conditions for film to appear bright or dark in the reflected light are just reverse to those in the transmitted light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

32. A : If a thin soap film is arranged vertically the spectrum of coloured fringes are spread equally on the film.

R : The colours of the film is dependent on the thickness of film and wavelength of the light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

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33. Radio waves diffract around building, although light waves do not. The reason is that radio waves

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

34. A : It is impossible to see an object as small as an atom regardless of the quality of light used by microscope.

R : In order to see.. an object, wave length of light in the microscope must be comparable to the size of object.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

35. A : Diffraction is common is sound but not common in light waves

R : Wavelengths of light is more than the wavelength of sound.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

36. A : There is no specific important physical difference between interference and diffraction.

R : When there are only few sources (say two), the result is usually called interference, but if there is a large number of sources, the result is diffraction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

37. A : At the first glance, the top surf Morpho butterfly.s wing appears a beautifu blue green. If the wing moves the colour changes.

R : Different pigments in the wing reflect light at different angles.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

38. A : Coloured spectrum is seen when we look through a muslin cloth.

R : The coloured spectrum is due to diffraction of white light on passing through fine slits made by fine threads in the muslin cloth.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

39. Assertion : The clouds in sky generally appear to be whitish.

Reason : Diffraction due to clouds is efficient in equal measure at all wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

40. A : In double slit experiment, the pattern on the screen is actually a superposition of sngle-slit diffraction from each slit and the double -slit interference pattern.

R : The diffraction pattern has a central bright maximum which is twice as wide as the other maxima.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

41. Assertion : Standard optical diffraction gratings cannot be used for discriminating between different X-ray wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

42. A : When tiny circular obstacle is placed in the path of light from some distance, a bright spot is seen at the centre of the shadow of the obastacle.

R : Destructive interference occurs at the centre of the shadow of circular obstacle.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

43. A : The resolving power of both miroscope and telescope depends on the wavelength of the light used.

R : The resolving power of a lens is the ability to resolve the two images so that they are distinctly identified.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

Watch Video Solution

44. A : The resolving power of an electron microscope is higher than that of an optical microscope.

R : The wavelength of electron is less than the wavelength of visible light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

45. Assertion (A) To increase resolving power of a telescope, the aperture (a) of the object should be large.

Reason (R) Resolving power of the telescope is given by $\frac{2a}{1.22\lambda}$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: D

Watch Video Solution

46. A : To increase the resolving power of a microscope, .oil immersion objective. can be used.

R : Resolving power of the microscope is given by the reciprocal of the maximum separation of two objects distinctly seen.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

47. Assertion : The resolving power of a telescope is more if the diameter of the objective lens is more.

Reason : Objective lens of large diameter collects more light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

48. A : Resolving power of a microscope can be increased by choosing a medium of higher refractive index between object and objective lens.

R : To increase resolving power of microscope, usually on oil having R.I colse to that of objective glass is used.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

49. A : Spy satilight cameras use lenses with very large aperatures.

R : In general, larger the aperture in an optical instrument, the greater the resolution.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

Watch Video Solution

50. A : Transverse wave nature of light is proved by polarisation.

R : According to Maxwell, light is an electromagnetic wave but not mechanical wave.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

51. A : Nicol prism is used to produce and analyse plane polarised light.

R : Nicol prism reduces the intensity of light to zero.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

52. A : When an unpolarised light is incident on a glass plate at Brewster angle, the reflected ray and refracted ray are matually perpendicular.

R : The refractive index of glass is equal to sine of the angle of polarisation.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

53. A : The unpolarised light and polarised light can be distinguished from each other by using polaroid.

R : A polaroid is capable of producing plane polarised beams of light.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

54. A : Light coming from numbers of calculator.s L.C.D display is polarised.

R : The reflected light cannot be polarized when light is incident normal to the plane surface.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

55. A : One of the images in double refraction doesn't obey the principles of refraction.

R : Extraordinary image in double refraction doesn't obey the principles of refraction because its velocity changes with direction.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

56. Assertion (A): Skiers uses air glasses.

Reason(R) : Light reflected by snow is partially polarised.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

57. A : 3-D movies are produced by pojecting two images onto a screen, with polarizing dissections that are 90° relative to one another.

R : When your eyes view 3D wearing 3D glasses, your right eye sees one view and left eye sees the other view, these views combines in the brain and produce 3D effect.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

58. Assertion:- Newton's rings are formed in the reflected system. When the space between the lens and the glass place is filled with a liquid of regractive index greater than that of glass, the central spot of the pattern is bright.

Reason:- This is because the reflection in these cases will be from a denser to raer medium and the two interfering rays are reflected under similar conditions.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

59. A : In a movie ordinary 24 frames are projected per second from one end to the other of the complete film.

R : The image formed on the retina of the eye is sustained upto $(1/10)$s after the removed of the stimulus.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

60. A : A famous painting was painted by not using brush strokes in the usual manner, but rather a myriad of small colour dots. The colour you see it any given place on the painting, changes as you move away.

R : The angular separation of adjacent dots changes with the distance between them in the painting.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

61. Assetion To observe diffraction of light the size of obstacle/aperture should be of the order of $10^{-7}m$

Reason $10^{-7}m$ is the order of wavelength of visible light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

62. Assertion (A) : The film which appears bright in reflected system will appear dark in the transmitted system and vice-versa.

Reason (R) : The conditions for film to appear bright or dark in the reflected light are just reverse to those in the transmitted light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

63. Statement-1 : On viewing the clear blue portion of the sky through a Calcite Crystal, the intensity of transmitted light varies as the crystal is rotated.

Statement - 2 : The light coming from the sky is polarized due to scattering of sun light by particles in the atmosphere. The scattering is largest for blue light

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: A

Watch Video Solution

64. A : Diffraction determines the limitations of the concept of light rays.

R : A beam of width α starts to spread out due to diffraction after it has travelled a diatance $(2\alpha^\circ/\lambda)$.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

65. A : When tiny circular obstacle is placed in the path of light from some distance, a bright spot is seen at the centre of the shadow of the obastacle.

R : Destructive interference occurs at the centre of the shadow of circular obstacle.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

66. A : At the first glance, the top surf Morpho butterfly.s wing appears a beautifu blue green. If the wing moves the colour changes.

R : Different pigments in the wing reflect light at different angles.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: C

Watch Video Solution

67. Assertion : Standard optical diffraction gratings cannot be used for discriminating between different X-ray wavelengths.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true and R is not the correct explanation of A

C. A is true and R is false

D. Both A and R are false

Answer: B

Watch Video Solution

EXERCISE -II (INTERFERENCE)

1. The wavelength of light received from a galaxy is 10% greater than that received from identical source on the earth. The velocity of the galaxy relative to the earth is

A. A) $3 \times 10^8 ms^{-1}$

B. B) $3 \times 10^7 ms^{-1}$

C. C) $3 \times 10^6 ms^{-1}$

D. D) $3 \times 10^5 ms^{-1}$

Answer: B

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2. Lesch Nyhan disease is an X-linked recessive disorder that causes neurological damage in human beings. A survey of 500 males from a caucasion population revealed that 20 were effected with this disorder. What is the frequency of the normal allele in this population ?

A. A) 3KHz

B. B) 30KHz

C. C) 3MHz

D. D) 30MHz

Answer: A

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3. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm?

A. A) $306km/s$

B. B) $306km/\min$

C. C) $306km/h$

D. D) $306m/s$

Answer: A

Watch Video Solution

4. The displacement of two interfering light waves are $y_1 = 4 \sin \omega t$ and $y_2 = 3 \cos(\omega t)$. The amplitude of the resultant waves is (y_1 and y_2 are in CGS system)

A. A. 5 cm

B. B. 7 cm

C. C. 1 cm

D. D. zero

Answer: A

Watch Video Solution

5. Light waves of wave length λ propagate in a medium. If M end N are two points on the wave front and they are separated by a distance $\lambda/4$, the phase difference between them will be (in radian)

A. $\pi/2$

B. $\pi/8$

C. $\pi/4$

D. zero

Answer: D

Watch Video Solution

6. When two coherent monochromatic light beams of intensities I and 4I are superimposed, the ratio between maximum and minimum intensities in the resultant beam is

A. A. $9:1$

B. B. $1:9$

C. C. $4:1$

D. D. $1:9$

Answer: A

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7. In an interference experiment, the ratio of the intensities of the bright and dark fringes is 16:1. The ratio of the amplitudes due to the two slits is

A. A) $3:1$

B. B) $4:1$

C. C) $5:1$

D. D) $5:3$

Answer: D

Watch Video Solution

8. A screen is at a distance of 2m from narrow slits that are illuminated with light of 589 nm. The 10th minimum lies at $0.005m$ on either side of the central maximum, then the distance between the slits will be

A. $0.024mm$

B. $2.23mm$

C. $2.4mm$

D. $24mm$

Answer: B

Watch Video Solution

9. In Young's double slit experiment with a mono - chromatic light of wavelength $4000A^{\circ}$, the fringe width is found to be 0.4 mm. When the slits are now illuminated with a light of wavelength $5000A^{\circ}$ the fringe width will the

A. $0.32mm$

B. $0.5mm$

C. $0.6mm$

D. $0.8mm$

Answer: B

Watch Video Solution

10. In Young.s double slit interference experiment the wavelength of light used is $6000 A^0$. If the path difference between waves reaching a point P on the screen is 1.5 microns, then at that point P

A. second bright band occurs

B. second dark band occurs

C. third dark band occurs

D. third bright band occurs

Answer: C

Watch Video Solution

11. The intensity of central fringe in the interference pattern produced by two indetical slits is I. When one of the slits is closed then the intensity at the same points is I_0. The relation between I and I_0 is

A. $I = 4I_0$

B. $I = 2I_0$

C. $I = I_0$

D. $I = I_0/2$

Answer: A

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12. In the case of interference, the maximum and minimum intensities are in the 16 : 9. Then

A. the maximum and minimum amplitudes will be in the ratio 9 : 5

B. The intensities of the individual waves will be in the ratio 4 : 3

C. The amplitudes of the individual waves will be in the ratio 7 : 1

D. The amplitudes of the individual waves will be in the ratio 4 : 1

Answer: C

Watch Video Solution

13. In a double slit experiment, the distance between two slits in 0.6 mm and these are illuminated with light of wavelength 4800Å. The angular width of first dark fringe on the screen distant 120 cm from slits will be:

A. 8×10^{-4} radian

B. 6×10^{-4} radian

C. 4×10^{-4} radian

D. 16×10^{-4} radian

Answer: C

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14. In Young.s double slit experiment, blue-green light of wavelength 500nm is used. The slits are $1.20mm$ apart, and the viewing screen is $5.40m$ away from the slits. What is the fringe width.

A. $6.2mm$

B. $4.2mm$

C. $2.25mm$

D. $1.25mm$

Answer: C

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15. A double slit experiment is performed with light of wavelength 500 nm. A thin film of thickness 2 mm and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will:

A. remain unshifted

B. shift downward by nearly two fringes

C. shift upward by nearly two fringes

D. shift downward by 10 fringes

Answer: C

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16. When a mica plate of thickness $0.1mm$ is introduced in one of the interfering beams, the central fringe is displaced by a distance equal to 10 fringes. If the wavelength of the light is $6000A^0$, the refractive index of the mica is

A. 1.06

B. 1.6

C. 2.4

D. 1.2

Answer: A

Watch Video Solution

17. The maximum numbers of possible interference maxima for slit separation equal to twice the wavelength in Young's double slit experiment is

A. infinite

B. five

C. three

D. zero

Answer: B

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18. An electromagnetic wave emitted by source travels 21 km to arrive at a receiver. The wave while travelling in another path is reflected from a surface at 19 km away and further travels 12 km to reach the same receiver. If destructive interference occurs at the receiving end, the mximum wavelength of the wave is

A. $0.5km$

B. $1km$

C. $5km$

D. $10km$

Answer: D

Watch Video Solution

19. Four light sources produce the following four waves :

i. $y_1 = a'\sin(\omega t + \phi_1)$

ii. $y_2 = a'\sin(2\omega t)$

iii. $y^3 = a'\sin(\omega t + \phi_2)$

iv $y_4 = a'\sin(3\omega + \phi)$

Superposition of which two waves give rise to interfernce ?

A. I and II

B. II and III

C. I and III

D. III and IV

Answer: C

Watch Video Solution

20. In Young's double slit experiment, the 10^{th} maximum of wavelength λ_1 is at a distance y_1 from its central maximum and the 5^{th} maximum of wavelength λ_2 is at a distance y_2 from its central maximum. The ratio y_1 / y_2 will be

A. $\dfrac{2\lambda_1}{\lambda_2}$

B. $\dfrac{2\lambda_2}{\lambda_1}$

C. $\dfrac{\lambda_1}{2\lambda_2}$

D. $\dfrac{\lambda_2}{2\lambda_1}$

Answer: A

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21. The path difference between two interfering waves at a point on the screen is $\lambda/6$from central maximum. The ratio of intensity at this point and that at the central fringe will be

A. 0.75

B. 7.5

C. 85.3

D. 853

Answer: A

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22. In Young.s double slit experiment with monochromatic source of light of wavelength $6000A^2$, if the path difference at a point on the screen is $6 \times 10^{-6}m$, the number of the bright band formed at that point is

A. 2

B. 4

C. 6

D. 10

Answer: D

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23. A mixture of light, consisting of wavelength 590 nm and an unknown wavelength, illuminates Young's double slit and gives rise to two overlapping interference patterns on the screen. The central maximum of both lights coincide. Further, it is observed that the third bright fringe of known light coincides with the 4^{th} bright fringe of the unknown light. From this data, the wavelength of the unknown light is

A. $885.0 nm$

B. $442.5 nm$

C. $776.8 nm$

D. $393.4 nm$

Answer: B

Watch Video Solution

24. A monochromatice light beam of wavelength $5896A^0$ is used in double slit experiment to get interference pattern on a screen 9th bright fringe is seen at a particular position on the screen. At the same point on the screen, if 11th bright fringe is to be seen, teh wavelength of the light that is needed is (nearly)

A. $7014A^0$

B. $3525A^0$

C. $6780A^0$

D. $4824A^0$

Answer: D

Watch Video Solution

25. The maximum intensity in Young.s double slit experiment is I_0. Distance between slits is $d = 5\lambda$, where λ is the wavelenght of the monochromatic light used in the experiment. What will be the intensity of light in front of one of the slits on a screen at a distance $D = 10d$.

A. I_0

B. $\frac{I_0}{4}$

C. $\frac{3}{4}I_0$

D. $\frac{I_0}{2}$

Answer: D

Watch Video Solution

26. Young's double slit experiment is first performed in air and then in a medium other than air. It is found than 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly

A. 1.78

B. 1.25

C. 1.59

D. 1.69

Answer: A

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EXERCISE -II (DIFFRACTION)

1. A slit of width a is illuminiated by white light. The first diffraction minimum for light of $\lambda = 6500\text{Å}$ is formed at $\theta = 30^\circ$, then the width a of the slit is

A. $3250A^0$

B. 1.3 micron

C. 6.5×10^{-4} mm

D. $2.6 \times 10^{-4} m$

Answer: B

Watch Video Solution

2. If I_0 is the intensity of the pricipal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled ?

A. I_0

B. $I_0/2$

C. $2I_0$

D. $4I_0$

Answer: D

Watch Video Solution

3. The ratio of radii of Fresnel.s fourth and ninth zone is

A. $1:4$

B. $4:9$

C. $9:4$

D. $2:3$

Answer: D

Watch Video Solution

4. Light of wavelength $5000A^0$ is incident on a slit. The first minimum of the diffraction pattern is observed to lie at a distance of 5 mm from the central maximum on a screen placed at a distance of 3 m from the slit. Then the width of the slit is

A. $3cm$

B. $0.3cm$

C. $0.03cm$

D. $0.06cm$

Answer: C

Watch Video Solution

5. A small aperture is illuminated with a parallel beam of $\lambda = 628nm$. The emergent beam has an angular divergence of 2^0. The size of the aperture is

A. $9\mu m$

B. $18\mu m$

C. $27\mu m$

D. $36\mu m$

Answer: B

Watch Video Solution

6. In single slit diffraction $a = 0.14mm, D = 2m$ and distance of second dark band from central maxima is $1.6cm$. The wavelength of light is

A. $6500A^0$

B. $7500A^0$

C. $5600A^0$

D. $8500A^0$

Answer: C

Watch Video Solution

7. The width of a slit is $0.012mm$. Monochromatic light is incident on it. The angular position of first bright line is

5.2^0. The wavelength of the light incident is

A. $6040A^0$

B. $4026A^0$

C. $5890A^0$

D. $7248A^0$

Answer: D

Watch Video Solution

8. The distace between the first and the sixth minima in the diffraction pattern of a single slit is $0.5mm$. The screen is $0.5m$ away from the slit. If wavelength of the light used is $5000A^0$, then the slit width will be

A. $5mm$

B. $2.5mm$

C. $1.25mm$

D. $1.0mm$

Answer: B

Watch Video Solution

9. The angular resolution of a 10 cm diameter telescope at a wavelength of $5000a^0$ is of the order of

A. $10^6 rad$

B. $10^{-2} rad$

C. $10^{-4} rad$

D. $10^{-6} rad$

Answer: D

Watch Video Solution

10. In a double slit experiment, the two slits are $1mm$ apart and the screen is placed $1m$ away. A monochromatic light of wavelength $500nm$ is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single-slit pattern?

A. $0.5mm$

B. $0.02mm$

C. $0.2mm$

D. $0.1mm$

Answer: C

Watch Video Solution

11. In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30° when light of wavelength 5000Å is incident on the slit. The first secondary maximum is observed at an angle of

A. $\sin^{-1}\left(\frac{1}{4}\right)$

B. $\sin^{-1}\left(\frac{2}{3}\right)$

C. $\sin^{-1}\left(\frac{1}{2}\right)$

D. $\sin^{-1}\left(\frac{3}{4}\right)$

Answer: D

Watch Video Solution

12. The hale telescope of mount Polamor has a diameter of 200 inches. What is its limiting angle of resolution for 600 nm light?

A. $7.2 \times 10^{-8} rad$

B. $7.2 \times 10^{-4} rad$

C. $1.44 \times 10^{-7} rad$

D. $14.4 \times 10^{-10} rad$

Answer: C

Watch Video Solution

13. Two stars distant two light years are just resolved by a telescope. The diameter of the telescope lens is $0.25m$. If the wavelength of light used is $5000A^0$, then the minimum distance between the stars is

A. $1.22 \times 10^{11} m$

B. $2.44 \times 10^{11} m$

C. $3.66 \times 10^{10} m$

D. $4.88 \times 10^{10} m$

Answer: D

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14. The diameter of an eye lens is $2.5 \times 10^{-3} m$ and the refractive index of the eye lid is 1.44. The resolving power of the eye for light of wavelength $5000 A^0$ will be (in minute^{-1})

A. 1.07

B. 0.86

C. 1.71

D. 1.14

Answer: C

Watch Video Solution

15. The diameter of an object of a telescope, which can just resolve two stars situated an angular displacement of 10^{-4} degree, should be (λ=5000 A°)

A. $35mm$

B. $35cm$

C. $35m$

D. $24cm$

Answer: B

Watch Video Solution

16. Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects that human eye can resolve at 500 nm wavelength is :

A. $1\mu m$

B. $30\mu m$

C. $100\mu m$

D. $300\mu m$

Answer: B

Watch Video Solution

17. The ratio of resolving powsers of an optical microscope for two wavelengths $\lambda_1 = 4000A$ and $\lambda_1 = 6000A$ is

A. $16:81$

B. $8:27$

C. $9:4$

D. $3:2$

Answer: D

Watch Video Solution

EXERCISE -II (POLARISATION)

1. The angle of incidence at which reflected light is totally polarised for reflection from air to glass (refractive index n) is

A. $\tan^{-1}\left(\frac{1}{n}\right)$

B. $\sin^{-1}\left(\frac{1}{n}\right)$

C. $\sin^{-1}(n)$

D. $\tan^{-1}(n)$

Answer: D

Watch Video Solution

2. The amplitude of polarised light transmitted through a polariser is A. The amplitude of unpolarised light incident on it is

A. $\frac{A}{2}$

B. $\frac{A}{\sqrt{2}}$

C. $2A$

D. $\sqrt{2}A$

Answer: D

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3. Unpolarised light of intensity $32Wm^{-2}$ passes through three polarisers such that the transmission axis of the last polariser is crossed with first. If the intensity of the emerging light is $3Wm^{-2}$, the angle between the axes of the first two polarisers is

A. 45°

B. 60°

C. 30°

D. zero

Answer: C

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4. The axes of the polariser and analyser are inclined to each other at 60°. If the amplitude of the polarised light emergent through analyser is A. The amplitude of unpolarised light incident on polariser is

A. $A/2$

B. A

C. $2A$

D. $2\sqrt{2}A$

Answer: D

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5. An analyser is inclined to a polariser at an angle of 30°. The intensity of light emerging from the analyser is $1/n$th of that is incident on the polariser. Then n is equal to

A. 4

B. $4/3$

C. $8/3$

D. $1/4$

Answer: C

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6. Unpolarised ligh of intensity $32W/m^2$ passes through a polariser and analyer which are at ain angle of 30° with respect to each other. The intensity of the light coming from analyser is

A. $16\sqrt{3}W/m^2$

B. $12W/m^2$

C. $16W/m^2$

D. none

Answer: B

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7. Wave theory cannot explain the phenomena of

A. Polarization , B.Diffraction

C. Compton effect , D. Photoelectric effect

Which of the following is correct ?

A. A and B

B. B and D

C. C and D

D. D and A

Answer: C

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8. The critical angle of a transparent crystal is 45°. Then its polarizing angle is

A. $\theta = \tan^{-1}(\sqrt{2})$

B. $\theta = \sin^{-1}(\sqrt{2})$

C. $\theta = \cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

D. $\theta = \cot^{-1}(\sqrt{2})$

Answer: A

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9. A container made of glass $(\mu = 1.5)$ contains a liquid. A ray of light passing through the liquid falls on the bottom of the container at an angle of incidence $\theta = \tan^{-1}(0.9)$ and completely polarized. The ray should strike the bottom of the container at an angle of incidences so that it undergoes total internal reflection

A. $\tan^{-1}(1.5)$

B. $\sin^{-1}(0.9)$

C. $\tan^{-1}(0.75)$

D. $\sin^{-1}(0.45)$

Answer: B

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10. Two polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident of P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is :

A. $I_0/16$

B. $I_0/2$

C. $I_0/4$

D. $I_0/8$

Answer: D

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EXERCISE -III (DOPPLER EFFECT IN LIGHT, INTERFERENCE)

1. The frequency of waves emitted from a radar is 750 MHz. The frequency of reflected wave from the aeroplane as observed at the radar station is incrased by 2.5 KHz. The speed of aeroplane is.

A. $4Kms^{-1}$

B. $2Kms^{-1}$

C. $1Kms^{-1}$

D. $0.5Kms^{-1}$

Answer: D

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2. The spectral line of a given element in the light received from a distant star is shifted towards the longer wavelength by 0.032%. Duduce the velocity of star in the line of sight.

A. $96km/\sec$

B. $64km/\sec$

C. $115km/\sec$

D. $30km/\sec$

Answer: A

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3. Two coherent monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

A. 4I and I

B. 5I and 3I

C. 9I and I

D. 9I and 3I

Answer: C

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4. Waves of same amplitude and same frequency from two coherent source overlap at a point. The ratio of the resultant intensity when they arrive in phase to that when they arrive with 90° phase difference is

A. $1:1$

B. $\sqrt{2}:1$

C. $2:1$

D. $4:1$

Answer: C

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5. If interference is complete or cent percent then the frequency of observed crossover will be

A. $\frac{\sqrt{b}}{(b+1)}$

B. $\frac{2\sqrt{b}}{(b+1)}$

C. $\frac{\sqrt{b}}{(b+1)^2}$

D. $\left(\frac{\sqrt{b}+1}{\sqrt{b}-1}\right)^2$

Answer: B

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6. The distance between the tew slits in a Young's double slit experiment is d and the distance of the screen from the plane of the slits is b, P is a point on the screen directly infront of one of the slits. The path difference between the waves arriving at P from the two slits is

A. $\frac{d^2}{b}$

B. $\frac{d^2}{2b}$

C. $\frac{2d^2}{b}$

D. $\frac{d^2}{4b}$

Answer: B

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7. Light from two coherent sources of same amplitude and same wavelength illuminates the screen. The intensity of the central maximum is I. If the sources were noncoherent, the intensity at the same point will be

A. $I/2$

B. I

C. $I/\sqrt{2}$

D. $3I/4$

Answer: A

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8. In Young's double slit experiment an interference pattern is obtained for $\lambda = 6000\text{Å}$ coming from two coherent sources S_1 and S_2 At certain point P on the screen third dark fringe is formed. Then the path difference $S_1P - S_2P$ in microns is

A. 0.75

B. 1.5

C. 3.0

D. 4.5

Answer: B

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9. In young's double slit experiment the n^{th} red bright band coincides with $(n+1)^{th}$ blue bright band. If the wavelength of red and blue lights are $7500 A^{\circ}$ and $5000 A^{\circ}$, the value of 'n' is

A. 1

B. 2

C. 5

D. 4

Answer: B

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10. In Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen, when light of wavelength 600 nm is used. If the wavelength of light is changed to 400 nm, number of fringes observed in the same segment of the screen is given by

A. 12

B. 18

C. 24

D. 4

Answer: B

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11. In Young.s double slit experiment the distance between the sources is $7.7 \mu m$. If the wavelength of light used is 500 nanometre, the angular position of the third dark ringe from the centre fringe is

A. 10.9^{0}

B. 0.15^{0}

C. 11.3^{0}

D. 9.4^{0}

Answer: D

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12. In Young's experiment interference bands are produced on the screen placed at $1.5m$ from the slits $0.15mm$ apart and illuminated by light of wavelength 6000Å. If the screen is now taken away from the slit by 50 cm the change in the fringe width will be

A. $2 \times 10^{-4} m$

B. $2 \times 10^{-3} m$

C. $6 \times 10^{-3} m$

D. none

Answer: B

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13. The two coherent sources of equal intensity produce maximum intensity of 100 units at a point. If the intensity of one of the sources is reduced by 50% by reducing its width then the intensity of light at the same point will be

A. 90

B. 89

C. 67

D. 72.85

Answer: D

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14. The ratio of the intensities at minima to maxima in the interference pattern is 9 : 25. What will be the ratio of the widths of the two slits in the young's double slit experiment ?

A. $8:1$

B. $16:1$

C. $4:1$

D. $9:1$

Answer: B

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15. Two coherent monochromatic light sources are located at two vertices of an equilateral triangle if the intensity due to each of the sources independently is $1W/m^2$ at the third vertex, the resultant intensity due to both the sources at that point (i.e at the third vertex) is

A. zero

B. $\sqrt{2}$

C. 2

D. 4

Answer: D

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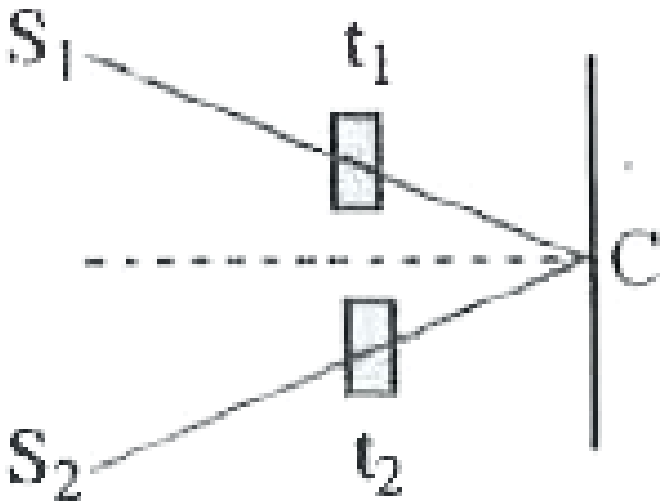
16. In Young's double slit experiment S_1 and S_2 are two slits. Films of thickness t_1 and t_2 and refractive indices μ_1 and μ_2 are placed in front of S_1 and S_2 respectively. If

$\mu_1 t_1 = \mu_2 t_2$, then the central maximum will :



A. not shift

B. shift towards S_2 irrespective of amounts of t_1 and t_2

C. shift towards S_2 irrespective of amounts of t_1 and t_2

D. shift towards S_1 if $t_2 > t_1$ and towards S_2 if $t_2 < t_1$.

Answer: D

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17. In a Young's double slit experiment using monochromatic light, the fringe pattern shifts by a certain distance on the screen when a mica sheet of refractive index 1.6 and thickness 1.964 microns is introduced in the path of one of the interfering waves. The mica sheet is then removed and the distance between the slits and screen is doubled. It is found that the distance between successive maxima now is the same as observed fringe shift upon the introduced of the mica sheet . Calculate the wavelength of the monochromatic light used in the experiment .

A. $5762A^0$

B. $5825A^0$

C. $6000A^0$

D. $6500A^0$

Answer: C

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18. When a thin transparent plate of Refractive Index 1.5 is introduced in one of the interfearing becomes, 20 fringes shift. If it is replaced by another thin plate of half the thickness and of R.I 1.7 the number of fringes that undergo displacement is

A. 23

B. 14

C. 28

D. 7

Answer: B

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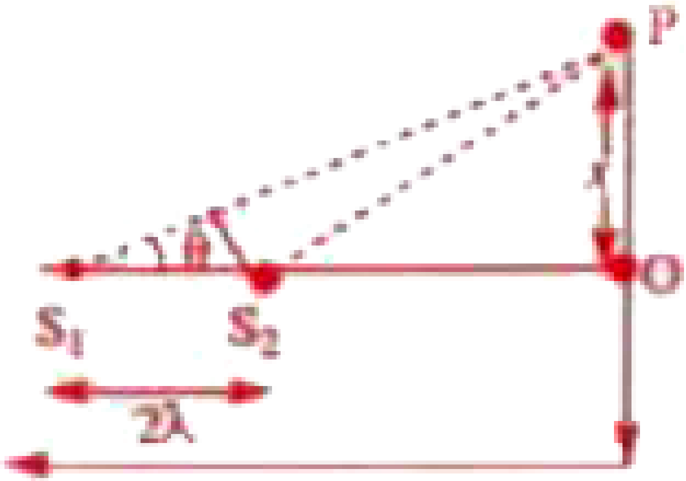
19. Two coherent point sources S_1 and S_2 vibrating in phase light of wavelength λ. The separation between them is 2λ as shown in figure. The first bright fringe is formed at .P. due to interference on a screen placed at a distance .D. from S_1 $(D > > \lambda)$, then OP is



A. $\sqrt{2}D$

B. $1.5D$

C. $\sqrt{3}D$

D. $2D$

Answer: C

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20. A transparent glass plate of thickness 0.5 mm and refractive index 1.5 is placed infront of one of the slits in a double slit experiment. If the wavelength of light used is $6000 A^{\circ}$, the ratio of maximum to minimum intensity in the interference pattern is 25/4. Then the ratio of light intensity transmitted to incident on thin transparent glass plate is

A. $9 : 7$

B. $9 : 49$

C. $3 : 7$

D. $7 : 3$

Answer: B

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21. In the Young's double slit experiment using a monochromatic light of wavelength λ, the path difference (in terms of an integer n) corresponding to any point having half the peak intensity is :

A. $(2n+1)\lambda/2$

B. $(2n+1)\lambda/4$

C. $(2n+1)\lambda/8$

D. $(2n+1)\lambda/16$

Answer: B

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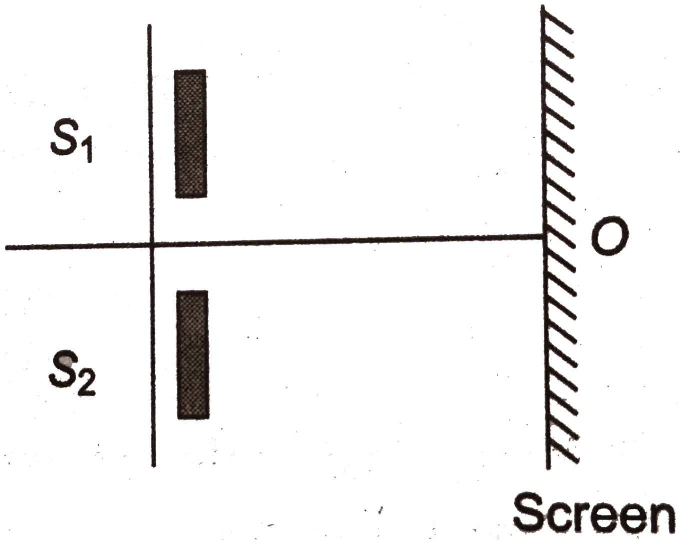
22. YDSE is carried with two thin sheets of thickness 10.4μm each and refractive index $\mu_1 = 1.52$ and $\mu_2 = 1.40$ covering the slits S_1 and S_2 respectively. If white light of range 400nm to 780 nm is used, then which wavelength will form maxima exactly at point O, the centre of the screen



A. $4200 A^0$ only

B. $7000 A^0$ only

C. $5250 A^0$ only

D. $4200 A^0 \quad \text{and} \quad 7000 A^0$

Answer: D

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23. In the Young's double slit experiment, the intensity of light at a point on the screen where the path difference is λ is K, (λ being the wave length of light used). The intensity at a point where the path difference is $\lambda/4$, will be

A. K

B. $K/4$

C. $K/2$

D. zero

Answer: C

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24. In Young.s double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000 A^0$ and $\lambda_2 = 10,000 A^0$. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. $3mm$

B. $8mm$

C. $6mm$

D. $4mm$

Answer: C

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25. In a Young.s interference experimental arrangement, the yellow light is composed of two wavelengths $5890A^{0}$ and $5895A^{0}$. The distance between the two slits is $10^{-3}m$ and screen is placed 1m away. Upto what order can fringes be seen?

A. 589

B. 280

C. 440

D. 339

Answer: A

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EXERCISE -III (DIFFRACTION)

1. Light of wavelength $6000A^0$ is incident on a single slit. The first minimum of the diffraction pattern is obtained at 4 mm from the centre. The screen is at a distance of 2m from the slit. The slit width will be

A. $0.3mm$

B. $0.2mm$

C. $0.15mm$

D. $0.1mm$

Answer: A

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2. Consider Fraunhoffer diffraction pattern obtained with a single slit illuminated at normal incidence. AT the angular position of the first diffraction minimum the phase difference (in radian) between the wavelengths from the opposite edges of the slit is

A. $\pi/4$

B. $\pi/2$

C. π

D. 2π

Answer: D

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3. Light of wavelength λ from a point source falls on a small circular rings around a central bright spot are formed on a screen beyond the obstacle The distance between the screen and obstacle is D. Then, the condition for the formation of rings, is

A. $\lambda \approx \frac{D}{4}$

B. $\sqrt{\lambda} \approx \frac{d}{4D}$

C. $\lambda \approx \frac{d^2}{D}$

D. $d \approx \frac{\lambda^2}{D}$

Answer: C

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4. A parallel beam of fast moving electrons is incident normally on a narrow slit. A flueroscent screen is placed at a large distance from the slit. If the speed of the electron is increased, which of the following statements is correct ?

A. Diffraction pattern is not observed on the screen in the case of electrons.

B. The angular width of the central maximum of the diffraction pattern will increase.

C. the angular width of central maximum will decrease

D. the angular width of central maximum will be unaffected

Answer: C

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5. Two point sources distant $0.1m$ away viewed by a telescope. The objective is covered by a screen having a hole of 1mm width. If the wavelength fo the light used is

$6550A^0$, then the maximum distance at which the two sources are seen just resolved, will be nearly

A. $125.0m$

B. $164m$

C. $131m$

D. $163m$

Answer: A

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6. The numerical aperture of an objective of a microscope is 0.5 and the wavelength of light used is $5000A^0$. Its limit of resolution will be

A. $6.1 \times 10^7 m$

B. $6.1 \times 10^{-7} m$

C. $6.1 \times 10^{-4} m$

D. $6.1 \times 10^4 m$

Answer: B

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7. The human eye has an approximate angluar resolution of $\phi = 5.8 \times 10^{-4}$ rad and a typical photoprinter prints a minimum of 300 dpi (dots per inches, 1 inch =2.54 cm). At what minimal distance z should a printed page be held so that one does not see the individual dots.

A. 37.3

B. 44.1

C. 25

D. 14.7

Answer: D

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8. In an experiment of single slit diffraction pattern first minimum for red light coincides with first maximum of some other wavelength. If wavelength of red light is $6600A^0$, then wavelength of first maximum will be :

A. $55000A^0$

B. $4400A^0$

C. $3300A^0$

D. $6600A^0$

Answer: B

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9. Estimate the distance for which ray optics is good approximation for an aperture of 4 mm and wavelength 400 nm ?

A. $40m$

B. $4 \times 10^{-3} m$

C. $100 nm$

D. $10 mm$

Answer: A

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10. Find the maximum magnifying power of a compound microscope having a 25 diopter lens as the objective, a 5 diopter lens as the eyepiece and the separation 30 cm between the two lenses. The least distance for clear vision is 25 cm.

A. 250

B. 400

C. 220

D. 100

Answer: C

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11. Calculate the least value of the angular separation of two stars which can be resolved by a telescope of 200 cm aperture. If the aperture of the human eye be 2mm and if the focal length of the eyepiece be 1 inch, what must be the minimum focal length of the objective if full resolving power of the telescope is to be utilized. Take $\lambda = 5500 A^0$.

A. $6.7 \times 10^{-7} rad$, 500 inches

B. $1.65 \times 10^{-7} rad$, 1000 inches

C. $3.35 \times 10^{-7} rad$, 1000 inches

D. none

Answer: C

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EXERCISE -III (POLARISITION)

1. A ray of light is incident on the surface of a glass plate of refractive index $\sqrt{3}$ at the polarising angle . The angle of incidence and angle of refraction of the ray is

A. $60^\circ, 30^\circ$

B. $30^\circ, 60^\circ$

C. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right), 45^\circ$

D. $\tan^{-1}\left(\frac{\sqrt{3}}{1}\right), 30^\circ$

Answer: A

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2. A beam of unpolarised light is incident on a tourmaline crystal C_1. The intensity of the emergent light is I_0 and it is incident on another tourmaline crystal C_2. It is found that no light emerges from C_2. If now C_1 is rotated through

45° towards C_2, the intensity of the light emerging from C_2 is

A. zero

B. $\frac{I_0}{4}$

C. $\frac{I_0}{2}$

D. $\frac{3I_0}{4}$

Answer: C

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3. Two polaroids are kept crossed to each other . If one of them is rotated an angle 60° , the percentage of incident light now transmitted through the system is

A. $30\ \%$

B. $37.5\ \%$

C. $40\ \%$

D. $60\ \%$

Answer: B

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4. Two nicol prisms are inclined to each other at an angle 30°. If I is the intensity of ordinary light incident on the first prism, then the intensity of light emerges from the second prism will be

A. $3I/4$

B. $I/2$

C. $I/4$

D. $3I/8$

Answer: D

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5. Two polarising plates have polarising directions parallel score to trasmit maxmum intensity of light through what angle most either plate be turned in the intensites of the transmitted beam is to drop by half?

A. 60° or 120°

B. 45° or 135°

C. 30° or 150°

D. 0° or 180°

Answer: B

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6. Two polaroids are kept crossed to each other. Now one of them is rotated through an angle of 45°. The percentage of unpolarized incident light now transmitted through the system is :

A. 30%

B. 25%

C. 40%

D. 62.5%

Answer: B

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7. Unpolarized light of intensity I_0 is incident on surface of a block of glass of Brewster's angle. In that case, which one of the following statements is true?

A. transmitted light is partially polarized with intensity $I_0/2$

B. reflected light is partially polarized with intensity $I_0/2$

C. reflected light is completely polarized with intensity less then $I_0/2$

D. transmitted light is completely polarized with intensity less then $I_0/2$

Answer: C

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8. In Young.s double slit experiment the separation d between the slits is 2mm, the wavelength λ of the light used is $5896 A^0$ and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20^0. To increase the fringe angular width to 0.21^0 (with same λ and D) the separation between the slits needs to be changed to

A. $1.8mm$

B. $1.9mm$

C. $1.7mm$

D. $2.1mm$

Answer: B

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9. An stronmical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

A. small focal length and large diameter

B. large focal length and small diameter

C. small focal length and small diameter

D. large focal length and large diameter

Answer: D

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10. Unpolarised light is incident from air on a plane surface of a material of refractive index . μ. . At a particular angle of incidence .I., it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation?

A. reflected light is polarized with its electric vector parallel to the plane of incidence

B. reflected light is polarized with its electric vector perpendicular to the plane of incidence

C. $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

D. $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

Answer: B

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