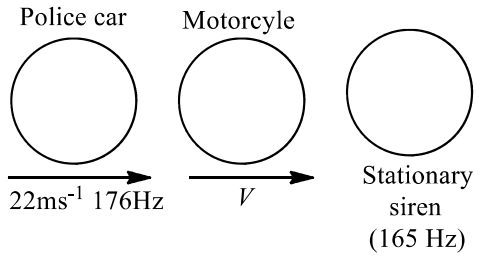
GPLUS EDUCATION

Date :
Time : **PHYSICS**
Marks :

WAVES

Single Correct Answer Type

1. A police car moving at22 ms^{-1}, changes a motorcyclist. The police man sounds his horn at 176 Hz, while both of them move towards a stationary siren of frequency 165 Hz. Calculate the speed of the motorcycle, if it is given that he does not observe any beats.



a) $33ms^{-1}$ b) 22 ms^{-1} c) Zero d) $11ms^{-1}$

2. A stone is hung in air from a wire which is stretched over a sonometer. The bridges of the sonometer are $L\ cm$ apart when the wire is in unison with a tuning fork of frequency N. When the stone is completely immersed in water, the length between the bridges is $l\ cm$ for re-establishing unison, the specific gravity of the material of the stone is

a) $\frac{L^2}{L^2+l^2}$ b) $\frac{L^2-l^2}{L^2}$ c) $\frac{L^2}{L^2-l^2}$ d) $\frac{L^2+l^2}{L^2}$

3. A man standing between two parallel hills, claps his hand and hears successive echoes at regular intervals of $11s$. If velocity of sound is $340ms^{-1}$, then the distance between the hills is

a) $100m$ b) 170 m c) 510 m d) 340 m

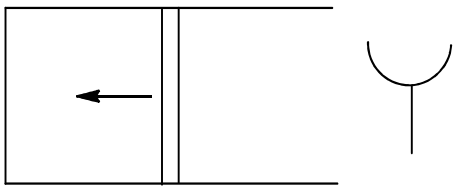
4. The disc of a siren containing 60 holes rotates at a constant speed of 360 rpm. The emitted sound is in unison with a tuning fork of frequency

a) 10 Hz b) 360 Hz c) 216 Hz d) 60 Hz

5. A wire of density $9 \times 10^3\ kgm^{-3}$ is stretched between two clamps 1m part and is subjected to an extension of$4.9 \times 10^{-4}m$. The lowest frequency of transverse vibration in the wire is $Y = 9 \times 10^{10}Nm^{-2}$)

a) 40 Hz b) 35 Hz c) 30 Hz d) 25 Hz

6. A piston fitted in cylindrical pipe is pulled as shown in the figure. A tuning fork is sounded at open end and loudest sound is heard at open length 13cm, 41 cm and 69 cm, the frequency of tuning fork if velocity of sound is $350ms^{-1}$is



a) 1250 Hz b) 625 Hz c) 417 Hz d) 715 Hz

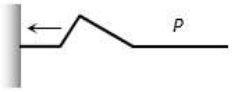
7. Quality of a musical note depends on

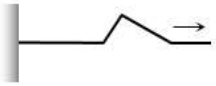
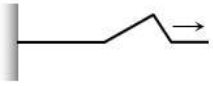
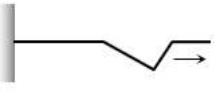
a) Harmonics present b) Amplitude of the wave
c) Fundamental frequency d) Velocity of sound in the medium

8. 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) $110ms^{-1}$ b) $165m^{-1}$ c) $77ms^{-1}$ d) $102ms^{-1}$

9. When an aeroplane attains a speed higher than the velocity of sound in air, a loud bang is heard. This is because
   a) It explodes
   b) It produces a shock wave which is received as the bang
   c) Its wings vibrate so violently that the bang is heard
   d) The normal engine noises undergo a Doppler shift to generate the bang
10. A tuning fork of frequency 200 Hz is in unison with a sonometer wire. The number of beats heard per second when the tension is increased by 1% is
    a) 1 b) 2 c) 4 d) 1/2
11. The frequency and velocity of sound wave are 600 Hz and 360 m/s respectively. Phase difference between two particles of medium are 60°, the minimum distance between these two particles will be
    a) 10 cm b) 15 cm c) 20 cm d) 50 cm
12. An observer is standing 500 m away from a vertically hill. Starting between the observer and the hill a police van having 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 $=330\ ms^{-1}$)
    a) 1042 b) 1032 c) 1022 d) 1012
13. An observer moves towards a stationary source of sound with a velocity one-fifth of the velocity of sound. What is the percentage increases in the apparent frequency?
    a) Zero b) 0.5% c) 5% d) 20%
14. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are
    a) Energy, momentum and mass b) Energy
    c) Energy and mass d) Energy and linear momentum
15. When a tuning fork vibrates, the waves produced in the fork are
    a) Longitudinal b) Transverse c) Progressive d) Stationary
16. A tuning fork of frequency 392 Hz, resonates with 50 cm length of a string under tension (T). If length of the string is decreased by 2%, keeping the tension constant, the number of beats heard when the string and the tuning fork made to vibrate simultaneously is
    a) 4 b) 6 c) 8 d) 12
17. A 1000 Hz sound wave in air strikes the surface of a lake and penetrates into water. If speed of sound in water is $1500 ms^{-1}$,the frequency and wavelength of waves in water are
    a) 1500 Hz, 1m b) 1000 Hz, 1.5m c) 1000 Hz, 1m d) 1500 Hz, 1.5m
18. If in a resonance tube a oil of density higher than that water is used then at the resonance frequency would
    a) Increase b) Decrease c) Slightly increase d) Remain same
19. Three sources of equal intensities with frequencies 400, 401 and 402 vib/s are sounded together. The number of beats/s is
    a) Zero b) 1 c) 2 d) 4
20. Figure here shown an incident pulse P reflected from a rigid support. Which one of A, B, C, D represents the reflected pulse correctly



a)  b)  c)  d) 

21. A cylindrical tube containing air is open at both ends. If the shortest length of the tube for resonance with a given fork is 2 cm, the next shortest length for resonance with the same fork will be
    a) 60 cm b) 40 cm c) 90 cm d) 80 cm

22. On which principle does sonometer works?
    a) Hooke's law b) Elasticity c) Resonance d) Newton's law
23. The intensity ratio of two waves is 1:9. The ratio of their amplitudes, is
    a) 3:1 b) 1:3 c) 1:9 d) 9:1
24. The driver of a car travelling with speed 30 $metres\ per\ second$ towards a hill sounds a horn of frequency 600 Hz. If the velocity of sound in air is 330 $metres\ per\ second$, the frequency of the reflected sound as heard by the driver is
    a) 720 Hz b) 555.5 Hz c) 550 Hz d) 500 Hz
25. The musical interval between two tones of frequencies 320 Hz and 240 Hz is
    a) 80 b) $\left(\frac{4}{3}\right)$ c) 560 d) 320×240
26. Two tuning fork, A and B produce notes of frequencies 258 Hz and 262 Hz. An unknown note sounded with a produces certain beats. When the same note is sounded with B, the beat frequency gets doubled, the unknown frequency is
    a) 256 Hz b) 254 Hz c) 300 Hz d) 280 Hz
27. The amplitude of two waves are in ratio 5:2. If all other conditions for the two waves Are same, then what is the ratio of their energy densities?
    a) 5:2 b) 5:4 c) 4:5 d) 25:4
28. 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 $\rho_1/\rho_2 = \frac{1}{4}$ then the ratio of velocities v_1 and v_2 will be
    a) $1:2$ b) $4:1$ c) $2:1$ d) $1:4$
29. The equation $y = A\cos^2(2\pi\, nt - 2\pi\frac{x}{\lambda})$ represents a wave with
    a) Amplitude $A/2$, frequency $2n$ and wavelength $\lambda/2$
    b) Amplitude $A/2$, frequency $2n$ and wavelength λ
    c) Amplitude A, frequency $2n$ and wavelength 2λ
    d) Amplitude A, frequency n and wavelength λ
30. A wavelength 0.60 cm is produced in air and it travels at a speed of 300 ms^{-1}. It will be an
    a) Audible wave b) Infrasonic wave c) Ultrasonic wave d) None of the above
31. The sound wave was produced in a gas is always
    a) Longitudinal b) Transverse c) Stationary d) Electromagnetic
32. Two Cu wires of radii R_1 and R_2such that $(R_1 > R_2)$. Then which of the following is true?
    a) Transverse wave travels after in thicker wire b) Transverse wave travels faster in thinner wire
    c) Travels with the same speed in both the wires d) Does not travel
33. A police car horn emits a sound at a frequency 240 Hz the frequency 240 Hz when the car is at rest. If the speed of sound is 330ms^{-1}, the frequency heard by an observer who is approaching the car at speed of 11 ms^{-1}, is
    a) 248 Hz b) 244 Hz c) 240 Hz d) 230 Hz
34. The apparent frequency of the whistle of an engine changes in the ratio 9:8 as the engine passes a stationary observer. If the velocity of the sound is 340ms^{-1} , then the velocity of the engine is
    a) 40 ms^{-1} b) 20 ms^{-1} c) 340 ms^{-1} d) 180 ms^{-1}
35. Two waves of frequencies 20 Hz and 30 Hz. Travels out from a common point. The phase difference between them after 0.6 sec is
    a) Aero b) $\frac{\pi}{2}$ c) π d) $\frac{3\pi}{2}$
36. The frequency of the fundamental note in a wire stretched under tension T is v. if the tension is increased to 25T, then the frequency of the fundamental note will be
    a) 25v b) 5v c) 10v d) V
37. Two stretched strings have length $\boldsymbol{l}$ and $2\boldsymbol{l}$ while tensions are T and 4T respectively. If they are made of same material the ratio of their frequencies is

a) 2:1 b) 1:2 c) 1:1 d) 1:4

38. The waves in which the particles of the medium vibrate in a direction perpendicular to the direction of wave motion is known as
a) Transverse wave b) Longitudinal waves c) Propagated waves d) None of these

39. The equation of progressive wave is $y = 0.2 \sin 2\pi \left[\frac{t}{0.01} - \frac{x}{0.3}\right]$, where x and y are in metre and t is in second. The velocity of propagation of the wave is
a) 30 ms^{-1} b) 40 ms^{-1} c) 300 ms^{-1} d) 400 ms^{-1}

40. The phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is0.5π. The wave velocity is
a) 144ms^{-1} b) 384ms^{-1} c) 256ms^{-1} d) 720ms^{-1}

41. The frequency of tuning forks A and B are respectively 3% more and 2% less than the frequency of tuning fork C. When A and B are simultaneously excited, 5 beats per second are produced. Then the frequency of the tuning fork $'A'$ in (in Hz) is
a) 98 b) 100 c) 103 d) 105

42. In a stationary wave all the particles
a) On either side of a node vibrate in same phase
b) In the region between two nodes vibrate in same phase
c) In the region between two antinodes vibrate in same phase
d) Of the medium vibrate in same phase

43. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having a distance 1.21 Å between them. The wavelength of the standing wave is
a) 1.21Å b) 1.42Å c) 6.05Å d) 3.63Å

44. A wave has velocity v in medium P and velocity 2v in medium Q. If the wave is incident in medium P at an angle of 30°, then the angle of refraction will be
a) 30° b) 45° c) 60° d) 90°

45. When both the listener and source are moving towards each other, then which of the following is true regarding frequency and wavelength of wave observed by the observer?
a) More frequency, less wavelength
b) More frequency, more wavelength
c) Less frequency, less wavelength
d) More frequency, constant wavelength

46. The fundamental frequency of a sonameter wire is v. if its radius is doubled and its tension becomes half, the material of the wire remains same, the new fundamental frequency will be
a) V b) $\frac{v}{\sqrt{2}}$ c) $\frac{v}{2}$ d) $\frac{v}{2\sqrt{2}}$

47. Beats are produced by two travelling waves each of loudness $I$and nearly equal frequencies $n_1$and n_2. The beat frequency will be …. and maximum loudness hard will be
a) $(n_1 - n_2)$,$2I$ b) $(n_1 - n_2)$,$4I$ c) $(n_1 - n_2)$,$3I$ d) $(n_1 - n_2), I$

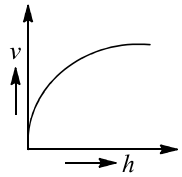
48. A pulse of a wave train travels along a stretched string and reaches the fixed end of the string. It will be reflected with
a) A phase change of 180° with velocity reversed
b) The same phase as the incident pulse with no reversal of velocity
c) A phase change of 180° with no reversal of velocity
d) The same phase as the incident pulse but with velocity reversed

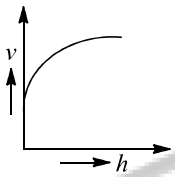
49. A progressive wave y=a sin [(kx-ωt)] is reflected by a rigid wall at x=0. Then the reflected wave can be represented by
a) y=a sin (kx+ωt) b) y=a cos (kx+ωt) c) y=-a sin (kx-ωt) d) y=-a sin (kx+ωt)

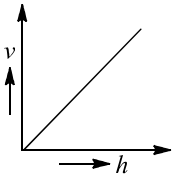
50. If the temperature is raised by 1 K from 300 K the percentage change in the speed of sound in the gaseous mixture is (R=8.31 J/mol-K)

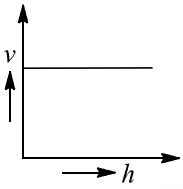
a) 0.167% b) 0.334% c) 1% d) 2%

51. Two open organ pipes gives 4 $beats/sec$ when sounded together in their fundamental nodes. If the length of the pipe are 100 cm and 102.5 cm respectively, then the velocity of sound is :
a) 496 m/s b) 328 m/s c) 240 m/s d) 160 m/s
52. At what speed should a source of sound move so that stationary observer finds the apparent frequency equal to half of the original frequency
a) $v/2$ b) $2v$ c) $v/4$ d) v
53. What is the base frequency if a pipe gives notes of frequencies 425, 255 and 595 and decide whether it is closed at one end or open at both ends
a) 17, closed b) 85, closed c) 17, open d) 85, open
54. In a sonometer wire, the tension is maintained by suspending a 50.7 kg mass from the free end of the wire. The suspended mass has a volume of 0.0075 m^3. The fundamental frequency of the wire is 260 Hz. If the suspended mass is completely submerged in water, the fundamental frequency will become (take $g = 10\ ms^{-2}$)
a) 240 Hz b) 230 Hz c) 220 Hz d) 200 Hz
55. A uniform rope having mass m hangs 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 shown in figure.

a) 

b) 

c) 

d) 

56. An aeroplane be is above the head of an observer and the sound appears to be coming at an angle of 60^0 with the vertical. If velocity of sound is v, then the speed of aeroplane is
a) v b) $\frac{\sqrt{3}}{2}v$ c) $\frac{v}{2}$ d) 2
57. In an open organ pipe... wave is present.
a) Transverse standing b) Longitudinal standing
c) Longitudinal moving d) Transverse moving
58. When beats are produced by two progressive waves of the same amplitude and of nearly the same frequency, the ratio of maximum loudness to the loudness of one of the waves will be n. Where n is
a) 3 b) 1 c) 4 d) 2
59. Ultrasonic, Infrasonic and audible waves travel through a medium with speeds V_u, V_i and V_a respectively, then
a) V_u, V_i and V_a are nearly equal b) $V_u \geq V_a \geq V_i$
c) $V_u \leq V_a \leq V_i$ d) $V_a \leq V_u$ and $V_u \approx V_i$
60. A wave travelling in stretched string is described by the equation $y = A\sin(kx - \omega t)$.The maximum particle velocity is
a) $A\omega$ b) ω/k c) $d\omega/dk$ d) x/t
61. The frequency of a whistle of an engine is 600 $cycles/sec$ is moving with the speed of 30 m/sec towards an observer. The apparent frequency will be (velocity of sound = 330 m/s)
a) 600 cps b) 660 cps c) 990 cps d) 330 cps
62. The second overtone of an open pipe is in resonance with the first overtone of a closed pipe of length 2m. length of the open pipe is
a) 4m b) 2m c) 8m d) 1m
63. Find the fundamental frequency of a closed pipe, if the length of the air column is 42 m. (speed of sound in air = 332 m/sec)
a) 2 Hz b) 4 Hz c) 7 Hz d) 9 Hz

64. Speed of sound at constant temperature depends on
a) Pressure b) Density of gas c) Above both d) None of the above

65. Out of the given waves (1), (2), (3) and (4)
$y = a\sin(kx + \omega t)$ ...(1)
$y = a\sin(\omega t - kx)$ ...(2)
$y = a\cos(kx + \omega t)$ ...(3)
$y = a\cos(\omega t - kx)$ ...(4)
Emitted by four different sources S_1, S_2, S_3 and S_4 respectively, interference phenomena would be observed in space under appropriate conditions when
a) Sources S_1 emits wave (1) and S_2 emits wave (2)
b) Source S_3 emits wave (3) and S_4 emits wave (4)
c) Source S_2 emits wave (2) and S_4 emits wave (4)
d) S_4 emits waves (4) and S_3 emits waves (3)

66. The angle between particle velocity and wave velocity in a transverse wave is
a) Zero b) $\pi/4$ c) $\pi/2$ d) π

67. When sound is produced in an aeroplane moving with a velocity of 200 ms^{-1}horizontal its echo is heard after $10\sqrt{5}$s. if velocity of sound in air is 300 $ms^{-1}$the elevation of aircraft is
a) 250 m b) 250 $\sqrt{5}m$ c) 12.50 m d) 2500 m

68. A wave travelling along a string is described by the equation $y = a\sin(\omega t - kx)$ the maximum particle velocity is
a) $a\omega$ b) $\frac{\omega}{k}$ c) $\frac{d\omega}{dk}$ d) $\frac{x}{l}$

69. 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) $y = 0.8A\sin(\omega t + kx)$ d) $y = A\sin(\omega t + 0.8kx)$

70. A wave travelling in positive X-direction with $A = 0.2m$ has a velocity of 360 m/sec. If $\lambda = 60m$, then correct expression for the wave is
a) $y = 0.2\sin\left[2\pi\left(6t + \frac{x}{60}\right)\right]$ b) $y = 0.2\sin\left[\pi\left(6t + \frac{x}{60}\right)\right]$
c) $y = 0.2\sin\left[2\pi\left(6t - \frac{x}{60}\right)\right]$ d) $y = 0.2\sin\left[\pi\left(6t - \frac{x}{60}\right)\right]$

71. There are three of sources of sound of equal intensity with frequencies 400, 401 and 402 vib/sec. The number of beats heard per second is
a) 0 b) 1 c) 2 d) 3

72. In Melde's experiment, the string vibrates in 4 loops when a 50 g weight is placed in the pan of weight 15 g. To made the string vibrate in 6 loops, the weight that has to be removed from the pan in approximately
a) 7 g b) 36 g c) 21 g d) 29 g

73. Equations of a stationary wave and a travelling wave are $y_1 = a\sin kx\cos\omega t$ and$y_2 = a\sin(\omega t - kx)$. The phase difference between two points $x_1 = \frac{\pi}{3k}$ and $x_2 = \frac{3\pi}{2k}$ are ϕ_1 and ϕ_2 respectively for the two waves. The ratio $\phi_1/\phi_2$is
a) 1 b) 5/6 c) 3/4 d) 6/7

74. The ratio of speed of sound in nitrogen and helium gas at 300 K is
a) $\sqrt{\frac{2}{7}}$ b) $\frac{\sqrt{1}}{7}$ c) $\frac{\sqrt{3}}{5}$ d) $\frac{\sqrt{6}}{5}$

75. Apparatus used to find out the velocity of sound in gas is
a) Melde's apparatus b) Kundt's tube c) Quincke's tube d) None of these

76. Three waves of equal frequency having amplitudes 10 mm, 4 mm, and 7 mm arrive at a given point with successive phase difference of $\frac{\pi}{2}$, the amplitude of the resulting wave in mm is given by
a) 7 b) 6 c) 5 d) 4

77. Two trains, each moving with a velocity of 30 ms^{-1}, cross each other. One of the trains gives a whistle whose frequency is 600Hz. If the speed of sound is 330 ms^{-1} the apparent frequency for passengers sitting in the other train before crossing would be
a) 600 Hz b) 630 Hz c) 920 Hz d) 720 Hz

78. A device used for investigating the vibration of a fixed string of wire is
a) Sonometer b) Barometer c) Hydrometer d) None of these

79. The source producing sound and an observer both are moving along the direction of propagation of sound waves. If the respective velocities of sound, source and an observer are v, v_s and v_o, then the apparent frequency heard by the observer will be (n = frequency of sound)
a) $\frac{n(v+v_o)}{v-v_o}$ b) $\frac{n(v-v_o)}{v-v_s}$ c) $\frac{n(v-v_o)}{v+v_s}$ d) $\frac{n(v+v_o)}{v+v_s}$

80. Two sound waves (expressed in CGS units) given by $y_1 = 0.3\sin\frac{2\pi}{\lambda}(vt-x)$ and $y_2 = 0.4\sin\frac{2\pi}{\lambda}(vt-x+\theta)$ interfere. The resultant amplitude at a place where phase difference is $\pi/2$ will be
a) 0.7 cm b) 0.1 cm c) 0.5 cm d) $\frac{1}{10}\sqrt{7}\ cm$

81. The wavelength of two notes in air are $\frac{36}{195}$ m and $\frac{36}{193}$m. each note produces 10 beats per second separately with a third note of fixed frequency. The velocity of sound in air in m/s is
a) 330 b) 340 c) 350 d) 360

82. Law of superposition is applicable to only
a) Light waves b) Sound waves c) Transverse waves d) All kinds of waves

83. A car moving with a velocity of 36 km^{-1} crosses a siren of frequency 500 Hz. The apparent frequency of siren after passing it will be
a) 520 Hz b) 485 Hz c) 540 Hz d) 460 Hz

84. If the velocity of sound in air is 336 m/s. The *maximum* length of a closed pipe that would produce a just audible sound will be
a) 3.2 cm b) 4.2 m c) 4.2 cm d) 3.2 m

85. A whistle revolves in a circle with an angular speed of 20 rad/sec using a string of length 50 cm. If the frequency of sound from the whistle is 385 Hz, then what is the minimum frequency heard by an observer, which is far away from the centre in the same plane? ($v = 340\ m/s$)
a) 333 Hz b) 374 Hz c) 385 Hz d) 394 Hz

86. The velocity of sound I air is 330ms^{-1}. The rms velocity of air molecules ($\gamma = 1.4$) is approximately equal to
a) 400 ms^{-1} b) 471.4 ms^{-1} c) 231 ms^{-1} d) 462 ms^{-1}

87. For the stationary wave $y = 4\sin\left(\frac{\pi x}{15}\right)\cos(96\pi t)$, the distance between a node and the next antinode is
a) 7.5 b) 15 c) 22.5 d) 30

88. A source is moving towards an observer with a speed of 20 m/s and having frequency of 240 Hz. The observer is now moving towards the source with a speed of 20 m/s. Apparent frequency herad by observer, if velocity of sound is 340 m/s, is
a) 240 Hz b) 270 Hz c) 280 Hz d) 360 Hz

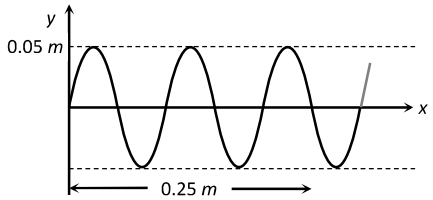
89. A tuning fork of frequency 340 Hz is vibrated just above the tube of 120 cm height. Water is poured slowly in the tube, what is the minimum height of water necessary for the resonance?
a) 45 cm b) 30 cm c) 35 cm d) 25 cm

90. Two waves are represented by $y_1 = 4\sin 404\pi t$ and $y_2 = 3\sin 400\pi t$. Then
a) Beat frequency is 4 Hz and the ratio of maximum to minimum intensity is 49 : 1
b) Beat frequency is 2 Hz and the ratio of maximum to minimum intensity is 49 : 1

c) Beat frequency is 2 Hz and the ratio of maximum to minimum intensity is $1:49$

d) Beat frequency is 4 Hz and the ratio of maximum to minimum intensity is $1:49$

91. If the speed of the wave shown in the figure is $330 m/s$ in the given medium, then the equation of the wave propagating in the positive x-direction will be (all quantities are in M.K.S. units)



a) $y = 0.05 \sin 2\pi(4000\, t - 12.5\, x)$ b) $y = 0.05 \sin 2\pi(4000\, t - 122.5\, x)$

c) $y = 0.05 \sin 2\pi(3300\, t - 10\, x)$ d) $y = 0.05 \sin 2\pi(3300\, x - 10\, t)$

92. What is the phase difference between two successive crests in the wave?

a) π b) $\pi/2$ c) 2π d) 4π

93. Two identical plain wires have a fundamental frequency of 600 cycle per second when kept under the same tension. What fractional increase in the tension of one wires 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

94. Two strings X and Y of a sitar produce a beat frequency $4Hz$. When the tension of the string Y is slightly increased the beat frequency is found to be 2 Hz. If the frequency of X is 300 Hz, then the original frequency of Y was

a) 296 Hz b) 298 Hz c) 302 Hz d) 304 Hz

95. Two waves of wavelength 1.00m and 1.01m produces 10 beats in 3s. What is the velocity of the wave?

a) 150 ms^{-1} b) 115.2 ms^{-1} c) 336.6 ms^{-1} d) 200 ms^{-1}

96. Two waves are approaching each other with a velocity of 16 m/s and frequency n. The distance between two consecutive nodes is

a) $\frac{16}{n}$ b) $\frac{8}{n}$ c) $\frac{n}{16}$ d) $\frac{n}{8}$

97. When two sound waves are superimposed, beats are produced when they have

a) Different amplitudes and phase b) Different velocities

c) Different phases d) Different frequencies

98. It takes 2.0 s for a sound wave to travel between two fixed points when the day temperature is 10°C. if the temperature rises to 30°C the sound wave travels between the same fixed parts in

a) 1.9s b) 2.0s c) 2.1s d) 2.2s

99. From a point source, if amplitude of waves at a distance r is A, its amplitude at a distance $2r$ will be

a) A b) $2A$ c) $A/2$ d) $A/4$

100. A tuning fork vibrating with a sonometer having 20 cm wire produces 5 beats per second. The beat frequency does not change if the length of the wire is changed to 21 cm. The frequency of the tuning fork (in Hertz) must be

a) 200 b) 210 c) 205 d) 215

101. When a sound wave of wavelength λ is propagating in a medium, the maximum velocity of the particle is equal to the velocity. The amplitude of wave is

a) λ b) $\frac{\lambda}{2}$ c) $\frac{\lambda}{2\pi}$ d) $\frac{\lambda}{4\pi}$

102. In a medium sound travels 2 km in 3 sec and in air, it travels 3 km in 10 sec. The ratio of the wavelengths of sound in the two media is

a) $1:8$ b) $1:18$ c) $8:1$ d) $20:9$

103. Velocity of sound is maximum in

a) Air b) Water c) Vacuum d) Steel

104. The fundamental frequency of a sonometre wire is n. If its radius is doubled and its tension becomes half, the material of the wire remains same, the new fundamental frequency will be

a) n b) $\frac{n}{\sqrt{2}}$ c) $\frac{n}{2}$ d) $\frac{n}{2\sqrt{2}}$

105. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is speed of sound, the expression for the beat frequency heard by the motorist is

a) $\frac{(v+v_m)f}{v+v_b}$ b) $\frac{(v+v_m)f}{v-v_b}$ c) $\frac{2v_b(v+v_m)f}{v^2-v_b^2}$ d) $\frac{2v_m(v+v_b)f}{v^2-v_b^2}$

106. If the velocity of sound in air is 350 m/s. Then the fundamental frequency of an open organ pipe of length 50 cm, will be

a) 350 Hz b) 1.75 Hz c) 900 Hz d) 750 Hz

107. If the pressure amplitude in a sound wave is tripled, then the intensity of sound is increased by a factor of

a) 9 b) 3 c) 6 d) $\sqrt{3}$

108. A police car with a siren of frequency 8 kHz is moving with uniform velocity 36 km/h towards a tall building which reflects the sound waves. The speed of sound in air is 320 m/s. the frequency of the siren heard by the car driver is

a) 8.5 kHz b) 8.25 kHz c) 7.25 kHz d) 7.5 kHz

109. A source producing sound of frequency 170 Hz is approaching a stationary observer with a velocity 17 ms^{-1}. The apparent change in the wavelength of sound heard by the observer is (speed of sound in air $= 340\ ms^{-1}$)

a) $0.1m$ b) $0.2m$ c) $0.4m$ d) $0.5m$

110. Two tuning fork of frequency n_1 and n_2 produces n beats per second. If n_2 and n are known, n_1 may be given by

a) $\frac{n_2}{n}+n_2$ b) $n_2 n$ c) $n_2 \pm n$ d) $\frac{n_2}{n}-n_2$

111. If the amplitude of sound is doubled and the frequency reduced to one-fourth, the intensity of sound at the same point will be

a) Increased by a factor of 2 b) Decreased by a factor of 2
c) Decreased by a factor of 4 d) Unchanged

112. When two sinusoidal waves moving at right angles to each other superimpose, they produce

a) Beats b) Interface c) Stationary waves d) Lissajous figure

113. Two stretched strings of same material are vibrating under same tension in fundamental mode. The ratio of their frequencies is 1 : 2 and ratio of the length of the vibrating segments is 1 : 4. Then the ratio of the radii of the strings is

a) 2 : 1 b) 4 : 1 c) 3 : 2 d) 8 : 1

114. A 20 cm long string, having a mass of 1.0 g, is fixed at both the ends. The tension in the string is 0.5 N. the string is set into vibration using an external vibrator of frequency 100 Hz. Find the separation (in cm) between the successive nodes on the string

a) 5 b) 6 c) 2 d) 3/2

115. The equation of a cylindrical progressive wave is

a) $y = a\sin\omega t$ b) $y = a\sin(\omega t - kr)$
c) $y = \frac{a}{\sqrt{r}}\sin(\omega t - kr)$ d) $y = \frac{a}{r}\sin(\omega t - kr)$

116. The sound carried by air from a sitar to a listener is a wave of the following type

a) Longitudinal stationary b) Transverse progressive
c) Transverse stationary d) Longitudinal progressive

117. The line of a sight of a jet plane makes an angle of 60^0 with the vertical, and the sound appears to be coming from over the head of the observer. The speed of jet plane is (taking speed of sound waves to be v)

a) v b) $v/\sqrt{3}$ c) $v\sqrt{3}$ d) $2v$

118. A spherical source of power 4 W and frequency 800 Hz is emitting sound waves. The intensity of waves at a distance 200 m is
a) $8 \times 10^{-6} W/m^2$ b) $2 \times 10^{-4} W/m^2$ c) $1 \times 10^{-4} W/m^2$ d) $4\ W/m^2$

119. The velocity of waves in a string fixed at both ends is 2 m/s. The string forms standing waves with nodes 5.0 cm apart. The frequency of vibration of the string in Hz is
a) 40 b) 30 c) 20 d) 10

120. 'SONAR' emits which of the following waves
a) Radio waves b) Ultrasonic waves c) Light waves d) Magnetic waves

121. When an engine passes near to a stationary observer then its apparent frequencies occurs in the ratio 5/3. If the velocity of engine is (Velocity of sound is 340 m/s)
a) 540 m/s b) 270 m/s c) 85 m/s d) 52.5 m/s

122. A big explosion on the moon cannot be heard on the earth because
a) The explosion produces high frequency sound waves which are inaudible
b) Sound waves require a material medium for propagation
c) Sound waves are absorbed in the moon's atmosphere
d) Sound waves are absorbed in the earth's atmosphere

123. The equation of a simple harmonic progressive wave is given by y=A sin ($100\pi t$-3x). find the distance between 2 particles having a phase difference of $\frac{\pi}{3}$.
a) $\frac{\pi}{9}$m b) $\frac{\pi}{18}$m c) $\frac{\pi}{6}$m d) $\frac{\pi}{3}$m

124. Beats are produced with the help of two sound waves of amplitudes 3 and 5 $units$. The ratio of maximum to minimum intensity in the beats is
a) 2 : 1 b) 5 : 3 c) 4 : 1 d) 16 : 1

125. A pulse or a wave train travels along a stretched string and reaches the fixed end of the string. It will be reflected back with
a) The same phase as the incident pulse but with velocity reversed
b) A phase change of 180°with no reversal of velocity
c) The same phase as the incident pulse with no reversal of velocity
d) A phase change of 180° with velocity reversed

126. A car is moving with a speed of 72 kmh^{-1}towards a hill. Car blows horn at a distance of 1800 m from the hill. If echo is heard after 10s, the speed of sound ($in\ ms^{-1}$)is
a) 300 b) 320 c) 340 d) 360

127. Sound of the wavelength λ passes through a Quincke's tube, which is adjust to give a maximum intensityI_0. Through what distance should the sliding tube be moved to give intensity$I_0/2$?
a) $\lambda/2$ b) $\lambda/3$ c) $\lambda/4$ d) $\lambda/8$

128. The time of reverberation of a room A is one second. What will be the time (in seconds) of reverberation of a room, having all the dimensions double of those of room A
a) $\frac{1}{2}$ b) 1 c) 2 d) 4

129. Two wires made up of same material are of equal lengths but their radii are in the ratio 1:2. On stretching each of these two string by the same tension, the ratio between the fundamental frequencies is
a) 1:2 b) 2:1 c) 1:4 d) 4:1

130. In the 3rd overtone of an open organ pipe, there are (N-stands for nodes and A-for antinodes)
a) $2N, 3A$ b) $3N, 4A$ c) $4N, 5A$ d) $5N, 4A$

131. The equation of a spherical progressive wave is
a) $y = a\ sin\omega t$ b) $y = a\ sin(\omega t - kr)$ c) $y = \frac{a}{\sqrt{r}}\sin(\omega t - kr)$ d) $y = \frac{a}{r} sin(\omega t - kr)$

132. A source and an observer are moving towards each other with a speed equal to $\frac{v}{2}$ where v is the speed of sound. The source is emitting sound of frequency n. The frequency heard by the observer will be

a) Zero b) n c) $\frac{n}{3}$ d) $3n$

133. A train moves towards a stationary observer with speed 34ms^{-1}. The train sounds a whistle and its frequency registered by the observer is f_1. If the train's speed is reduced to 17ms^{-1}, the frequency registered is f_2. If the peed of sound is 340ms^{-1}, then the ratio f_1/f_2 is

a) $\frac{18}{19}$ b) $\frac{1}{2}$ c) 2 d) $\frac{19}{18}$

134. A source of sound of frequency 600 Hz is placed inside water. The speed of sound in water is 1500 ms^{-1} and in air it is300 ms^{-1}. The frequency of sound recorded by an observer who is standing in air is

a) 200 Hz b) 300 Hz c) 120 Hz d) 600 Hz

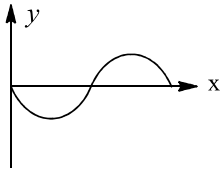
135. The equation of a simple harmonic wave is given by y=6sin 2 π (2t-0.1x), where x and y are in mm and t is in second. The phase difference between two particles 2 mm apart at any instant is

a) 18° b) 36° c) 54° d) 72°

136. A string is hanging from a rigid support. A transverse pulse is excited at its free end. The speed at which the pulse travels a distance x is proportional to

a) x b) $\frac{1}{x}$ c) $\frac{1}{\sqrt{x}}$ d) $\sqrt{x}$

137. In a sine wave, position of different particles at time $t = 0$ is shown in figure. The equation for this wave travelling along positive $x - axis$ can be



a) $y = A\sin(\omega t - kx)$ b) $y = A\cos(kx - \omega t)$ c) $y = A\cos(\omega t - kx)$ d) $y = A\sin(kx - \omega t)$

138. The frequency of fundamental tone in an open organ pipe of length 0.48 m is 320 Hz. Speed of sound is 320 m/sec. Frequency of fundamental tone in closed organ pipe will be

a) 153.8 Hz b) 160.0 Hz c) 320.0 Hz d) 143.2 Hz

139. A stationary point source of sound emits sound uniformly in all directions in a non-absorbing medium. Two points $P$and $Q$are at a distance of 4m and 9m respectively from the source. The ratio of amplitudes of the waves at $P$and $Q$is

a) $\frac{3}{2}$ b) $\frac{4}{9}$ c) $\frac{2}{3}$ d) $\frac{9}{4}$

140. Walls of auditorium should be

a) Good absorber b) Reflector c) Amplifier d) Modifier

141. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km it blows a whistle, whose echo is heard by the driver after 5 sec. If speed of sound in air is 330 m/s, the speed of engine is

a) 10 m/s b) 20 m/s c) 30 m/s d) 40 m/s

142. A micro-wave and an ultrasonic sound wave have the same wavelength. Their frequencies are in the ratio (approximately)

a) $10^6 : 1$ b) $10^4 : 1$ c) $10^2 : 1$ d) $10 : 1$

143. A uniform wire of length L, diameter D and density S is stretched under a tension T. the correct relation between its fundamental frequency *f,* the length L and the diameter D is

a) $f \propto \frac{1}{LD}$ b) $f \propto \frac{1}{L\sqrt{D}}$ c) $f \propto \frac{1}{D^2}$ d) $f \propto \frac{1}{LD^2}$

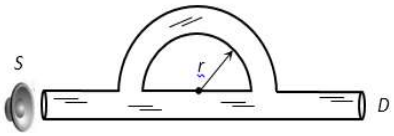
144. Which two of the given transverse waves will give stationary waves when get superimposed
$z_1 = a\cos(kx - \omega t)$ ...(A)
$z_2 = a\cos(kx + \omega t)$ ...(B)
$z_3 = a\cos(ky - \omega t)$ ...(C)
a) A and B b) A and C c) B and C d) Any two

145. In 1 m long open pipe what is the harmonic of resonance obtain with a tuning fork of frequency 480 Hz?
a) First b) Second c) Third d) Fourth

146. Given that $y = A\sin\left[\left(\frac{2\pi}{\lambda}(ct - x)\right)\right]$, where y and x are measured in metres. Which of the following statements is true
a) The unit of λ^{-1} is same as that of $\frac{2\pi}{\lambda}$ b) The unit of λ is same as that of x but not of A
c) The unit of c is same as that of $\frac{2\pi}{\lambda}$ d) The unit of $(ct - x)$ is same as that of $\frac{2\pi}{\lambda}$

147. A source of sound gives 5 beats s^{-1} when sounded with another source of frequency 100 Hz. The second harmonic of the source together with a source of frequency 205 Hz gives 5 beats s^{-1}. What is the frequency of the source?
a) 105 Hz b) 205 Hz c) 95 Hz d) 100 Hz

148. A sound wave of wavelength 32 cm enters the tube at S as shown in the figure. Then the smallest radius r so that a minimum of sound is heard at detector D is



a) 7 cm b) 14 cm c) 21 cm d) 28 cm

149. The frequency of a stretched uniform wire under tension is in resonance with the fundamental frequency of a closed tube. If the tension in the wire is increased by 8 N, it is in resonance with the first overtone of the closed tube. The initial tension in the wire is
a) 1 N b) 4 N c) 8 N d) 16 N

150. Stationary waves
a) Transport energy b) Does not transport energy
c) Have nodes and antinodes d) Both (b) and (c)

151. A transverse wave propagating on a stretched string of liner density 3×10^{-4} kg $-$ m^{-1} is represented by the equation $y = 0.2\ \sin(1.5x + 60t)$ where x is in meter and t is in second. The tension in the string (in newton) is
a) 0.24 b) 0.48 c) 1.20 d) 1.80

152. If the length of a closed organ pipe is 1m and velocity of sound is 330 m/s, then the frequency for the second note is
a) $4 \times \frac{330}{4} Hz$ b) $3 \times \frac{330}{4} Hz$ c) $2 \times \frac{330}{4} Hz$ d) $2 \times \frac{4}{330} Hz$

153. Consider the following
I. Waves created on the surface of a water pond by a vibrating sources
II. Wave created by an oscillating electric field in air
III. Sound waves travelling under water
Which of these can be polarized
a) I and II b) II only c) II and III d) I, II and III

154. A plane wave is represented by $x = 1.2\sin(314t + 12.56y)$. Where x and y are distances measured along in x and y direction in meters and t is time in seconds. This wave has
a) A wavelength of 0.25 m and travels in $+ ve\ x$ direction
b) A wavelength of 0.25 m and travels in $+ ve\ y$ direction

c) A wavelength of 0.5 m and travels in $-ve$ y direction

d) A wavelength of 0.5 m and travels in $-ve$ x direction

155. A particle on the trough of a wave at any instant will come to the mean position after a time(T=time period)

a) $\frac{T}{2}$ b) $\frac{T}{4}$ c) T d) 2T

156. An open organ pipe of length / vibrates in its fundamental mode. The pressure vibration is maximum

a) At the two ends b) At the distance 1/2 inside the ends

c) At the distance 1/4 inside the ends d) At the distance 1/8 inside the ends

157. A wave travelling along the x-axis is described by the equation y(x, t) =0.005 cos (αx-βt). If the wavelength and the time period of the wave are 0.08m and 2.0s, respectively, than α and β in appropriate unit are

a) a=25.00π, β π b) $\alpha = \frac{0.08}{\pi}, \beta = \frac{2.0}{\pi}$ c) $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$ d) $\alpha = 12.5\pi, \beta = \frac{\pi}{2.0}$

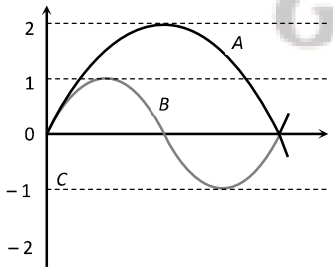
158. A tuning fork gives 5 beats with another tuning fork of frequency 100 Hz. When the first tuning fork is loaded with wax, then the number of beats remains unchanged, then what will be the frequency of the first tuning fork

a) 95 Hz b) 100 Hz c) 105 Hz d) 110 Hz

159. A plane wave is described by the equation $y = 3\cos\left(\frac{x}{4} - 10t - \frac{\pi}{2}\right)$. The maximum velocity of the particles of the medium due to this wave is

a) 30 b) $\frac{3\pi}{2}$ c) 3/4 d) 40

160. The displacement-time graphs for two sound waves A and B are shown in the figure, then the ratio of their intensities I_A/I_B is equal to



a) 1 : 4 b) 1 : 16 c) 1 : 2 d) 1 : 1

161. Two waves coming from two coherent sources, having different intensities interfere their ratio of maximum intensity to the minimum intensity is 25. The intensities of the sources are in the ratio

a) 25 : 1 b) 25 : 16 c) 9 : 4 d) 5 : 1

162. Two points on a travelling wave having frequency 500 Hz and velocity 300 ms^{-1} are 60° out of phase, then the minimum distance between two points is

a) 0.2 b) 0.1 c) 0.5 d) 0.4

163. An observer A sees an asteroid with a radioactive element moving by at a speed =0.3c and measure the radioactivity decay time to beT_A. Another observer B is moving with the asteroid and measures its decay time as T_B. Then $T_A$and T_B are released as

a) $T_B < T_A$ b) $T_A = T_B$

c) $T_B > T_A$ d) Either (A) or (c) depending on whether the asteroid is approaching or moving away from A

164. To raise the pitch of a stringed musical instrument the player can

a) Loosen the string b) Tighten the string c) Shorten the string d) Both (b) and (c)

165. The displacement of a particle is given by
$x = 3\sin(5\pi t) + 4\cos(5\pi t)$
The amplitude of the particle is
a) 3 b) 4 c) 5 d) 7

166. Frequency of a sonometer wire is n. Now its tension is increased 4 times and its length is doubled then new frequency will be
a) $n/2$ b) $4n$ c) $2n$ d) n

167. A closed organ pipe has fundamental frequency 100 Hz. What frequency will be produced, if its other end is also opened?
a) 200,400,600,800… b) 200,300,400,500…
c) 100,300,500,700… d) 100,200,300,400…

168. 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 the string is give by
a) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$ b) $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$
c) $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$ d) $n = n_1 + n_2 + n_3$

169. Sound waves in air always longitudinal because
a) Of the inherent characteristics of sound waves in air
b) Air does not have a modulus of rigidity
c) Air is a mixture of several gases
d) Density of air is very small

170. The first overtone in a closed pipe has a 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

171. An observer moves towards a stationary source of sound of frequency n. The apparent frequency heard by him is $2n$. If the velocity of sound in air is 332 m/sec, then the velocity of the observer is
a) 166 m/sec b) 664 m/sec c) 332 m/sec d) 1328 m/sec

172. The following phenomenon cannot be observed for sound waves
a) Refraction b) Interference c) Diffraction d) Polarisation

173. A string of mass 0.2 kg m has length $l = 0.6$m. It I fixed at both ends and stretched such that it has a tension of 80 N. The string vibrates in three segments with amplitude=0.5 cm. The amplitude of transverse velocity is
a) 9.42ms^{-1} b) 3.14ms^{-1} c) 1.57ms^{-1} d) 6.28ms^{-1}

174. A source emits a sound of frequency of 400 Hz, but the listener hearts its 390 Hz. Then
a) The listener is moving towards the source b) The source is moving towards the listener
c) The listener is moving away from the source d) The listener has a defective ear

175. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating frequency of the scanner is 4.0 MHz. The speed of should in a tissue is 1.7 $km - s^{-1}$. The wavelength of sound in the tissue is close to
a) $4 \times 10^{-4}m$ b) $8 \times 10^{-3}m$ c) $4 \times 10^{-3}m$ d) $8 \times 10^{-4}m$

176. Standing waves are produced by the superposition of two waves $y_1 = 0.05\sin(3\pi t + 2x)$
$y_2 = 0.05\sin(3\pi t + 2x)$ Where x and y are in meters and t is in second. What is the amplitude of the particle at $x = 0.5$ m? Given $cos57.3^0 = 0.54$.
a) 2.7 cm b) 5.4 cm c) 8.1 cm d) 10.8 cm

177. A tuning fork produced 4 beats/s when sounded with a sonometer wire of vibrating length is 50 cm. what is the frequency of the tuning fork?
a) 196 Hz b) 284 Hz c) 375 Hz d) 460 Hz

178. In Melde's experiment, three loops are formed by putting a weight of 8 g in a massless pan. The weight required to form two loop is
a) 18 g b) 8 g c) 36 g d) 24 g

179. The fundamental note produced by a closed organ pipe is of frequency f. The fundamental note produced by an open organ pipe of same length will be of frequency
a) $f/2$ b) f c) $2f$ d) $4f$

180. The tension of a stretched string is increased by 69%. In order to keep its frequency of vibration constant, its length must be increased by
a) 20% b) 30% c) $\sqrt{69}\%$ d) 69%

181. Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is
a) $\sqrt{8}$ b) $\sqrt{\frac{2}{17}}$ c) $\sqrt{\frac{1}{8}}$ d) $\sqrt{\frac{32}{17}}$

182. A point source emits sound equally in all direction in a non-absorbing medium. Two points P and Q are at distance of 2 and 3 m respectively from the source. The ratio of the intensities of the wave at P and Q is.
a) 9:4 b) 2:3 c) 3:2 d) 4:9

183. Sound waves travel at 350 m/s through a warm air and at 3500 m/s through brass. The wavelength of a 700 Hz acoustic wave as it enters brass from warm air
a) Decreases by a factor 20
b) Decreases by a factor 10
c) Increases by a factor 20
d) Increases by a factor 10

184. Two closed organ pipes A and B, have the same length. A is wider than B. They resonate in the fundamental mode at frequencies n_A and n_B respectively, then
a) $n_A = n_B$
b) $n_A > n_B$
c) $n_A < n_B$
d) Either (b) or (c) depending on the ratio of their diameters

185. If $y = 5\sin\left(30\pi t - \frac{\pi}{7} + 30°\right) y \to mm, t \to s, x \to m$.for given progressive wave equation, phase difference between two vibrating particle having path difference 3.5 m would be
a) $\pi/4$ b) π c) $\pi/3$ d) $\pi/2$

186. When the length of the vibrating segment of a sonometer wire is increased by 1% the percentage changes its frequency is
a) $\frac{100}{101}$ b) $\frac{99}{100}$ c) 1 d) 2

187. Two speakers connected to the same source of fixed frequency are placed 2.0 m apart in a box. A sensitive microphone placed at a distance of 4.0m from their midpoint along the perpendicular bisector shows maximum response. The box is slowly rotated until the speakers are in line with the microphone. The distance between the midpoint of the speakers and the microphone remains unchanged. Exactly five maximum responses are observed in the microphone in doing this. The wavelength of the sound wave is
a) 0.2 m b) 0.4 m c) 0.6 m d) 0.8 m

188. A tuning fork makes 256 vibrations per second in air. When the velocity of sound is 330 m/s, then wavelength of the tone emitted is
a) 0.56 m b) 0.89 m c) 1.11 m d) 1.29 m

189. If separation between screen and source is increased by 2% what would be the effect on the intensity
a) Increases by 4% b) Increases by 2% c) Decreases by 2% d) Decreases by 4%

190. A transverse wave of amplitude 0.5 m and wavelength 1 m and frequency 2 Hz is is propagating in a string in the negative x-direction. The expression for this wave is
a) $y(x,t) = 0.5\sin(2\pi x - 4\pi t)$
b) $y(x,t) = 0.5\cos(2\pi x + 4\pi t)$
c) $y(x,t) = 0.5\sin(\pi x - 2\pi t)$
d) $y(x,t) = 0.5\cos(2\pi x + 2\pi t)$

191. An iron load of 2 kg is suspended in air from the free end of a sonometer wire of length 1m. A tuning fork of frequency 256 Hz is in resonance with $1/\sqrt{7}$ time the length of the sonometer wire. If the load is immersed in metre that will be in resonance with the same tuning fork is (specified gravity of iron=8)
a) $\sqrt{8}$ b) $\sqrt{6}$ c) $\frac{1}{\sqrt{6}}$ d) $\frac{1}{\sqrt{8}}$

192. The phenomenon of sound propagation in air is
a) Isothermal process b) Isobaric process c) Adiabatic process d) None of these

193. A plane EM wave of frequency 30 MHz travels in free space along the x-direction. The electric field component of the wave at a particular point of space and time $E = 6\ V/m$ along y-direction. Its magnetic field component B at this point would be
a) 2×10^{-8} T along z-direction
b) 6×10^{-6} T along x-direction
c) 2×10^{-8} T along y-direction
d) 6×10^{-8} T along z-direction

194. In sine wave, minimum distance between 2 particles always having same speed is
a) $\frac{\lambda}{2}$ b) $\frac{\lambda}{4}$ c) $\frac{\lambda}{3}$ d) λ

195. If n_1, n_2, n_3 .... are the frequencies of segments of a stretched string, the frequency n of the string is given by
a) $n = n_1 + n_2 + n_3 +$ ....
b) $n = \sqrt{n_1 \times n_2 \times n_3 \times \ldots}$
c) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3} +$ ...
d) None of these

196. Intensity level 200 cm from a source of sound is 80 dB. If there is no loss of acoustic power in air and intensity of threshold hearing is $10^{-12} Wm^{-2}$ then, what is the intensity level at a distance of 4000 cm from source
a) Aero b) 54 dB c) 64 dB d) 44 dB

197. The equation of sound wave is
$y = 0.0015 \sin(62.4x + 316t)$
The wavelength of this wave is
a) 0.2 unit b) 0.1 unit c) 0.3 unit d) Cannot be calculated

198. An observer is moving away from source of sound of frequency 100 Hz. This speed is 33 m/s. If speed of sound is 330 m/s, then the observed frequency is
a) 90 Hz b) 100 Hz c) 91 Hz d) 110 Hz

199. A long glass tube is held vertically in water. A tuning fork is struck and held over the tube. Strong resonances are observed at two successive lengths 0.50 m and 0.84 m above the surface of water. If velocity of sound is 340 ms^{-1}, then the frequency of the turning fork is
a) 128 Hz b) 256 Hz c) 384 Hz d) 500 Hz

200. An open pipe of length l vibrates in fundamental mode. The pressure variation is maximum at
a) 1/4 from ends
b) The middle of pipe
c) The ends of pipe
d) At 1/8 from ends of pipe

201. The speed of sound in gas of density ρ at a pressure p is proportional to
a) $\left(\frac{p}{\rho}\right)^2$ b) $\left(\frac{p}{\rho}\right)^{\frac{3}{2}}$ c) $\sqrt{\frac{\rho}{p}}$ d) $\sqrt{\frac{p}{\rho}}$

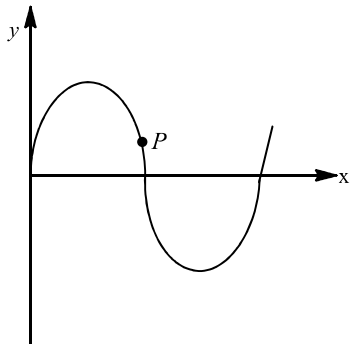
202. A sound absorber the sound level by 20 dB. The intensity decreases by a factor of
a) 1000 b) 10000 c) 10 d) 100

203. The frequency of fundamental note in an organ pipe is 240 Hz. On blowing air, frequencies 720 Hz and 1200 Hz are heard. This indicates that organ pipe is
a) A pipe closed at one end
b) A pipe open at both ends
c) Closed at both ends
d) Having holes like flute

204. When a wave travels in a medium, the particle displacement is given by the equation $y = a \sin 2\pi (bt - cx)$ where a, b and c are constants. The maximum particle velocity will be twice the wave velocity if

a) $c = \frac{1}{\pi a}$ b) $c = \pi a$ c) b=ac d) $b = \frac{1}{ac}$

205. A transverse sinusoidal wave moves along a string in positive x-direction at a speed of 10cms^{-2}. The wavelength of the wave is 0.5 m and its amplitude is 10.cm at a particular time t, the snap-shot of the wave is shown in figure. The velocity of point P when its displacement is 5 cm is



a) $\frac{\sqrt{3\pi}}{50}\hat{j}ms^{-1}$ b) $-\frac{\sqrt{3\pi}}{50}\hat{j}ms^{-1}$ c) $\frac{\sqrt{3\pi}}{50}\hat{i}ms^{-1}$ d) $-\frac{\sqrt{3\pi}}{50}\hat{j}ms^{-1}$

206. A man x can hear only upto 10 kHz and another man y upto 20 kHz. A note of frequency 500 Hz is produced before them from a stretched string. Then

a) Both will hear sounds of same pitch but different quality
b) Both will hear sounds of different pitch but same quality
c) Both will hear sounds of different pitch and different quality
d) Both will hear sounds of same pitch and same quality

207. Which of the following is the example of transverse wave

a) Sound waves b) Compressional waves in a spring
c) Vibration of string d) All of these

208. The phase difference between two points is π/3. If the frequency of waves is 50 Hz, then what is the distance between two points? (Given v=330 ms^{-1})

a) 2.2 m b) 1.1 m c) 0.6 m d) 1.7 m

209. The frequency of the sinusoidal wave $y = 0.40 \cos[2000t + 0.80x]$ would be

a) 1000 π Hz b) 2000 Hz c) 20 Hz d) $\frac{1000}{\pi} Hz$

210. An unknown frequency x produces 8 beats per seconds with a frequency of 250 Hz and 12 beats with 270 Hz source, then x is

a) 258 Hz b) 242 Hz c) 262 Hz d) 282 Hz

211. Which of the following functions represent a wave?

a) $(x - vt)^2$ b) $ln(x + vt)$ c) $e^{-(x+vt)2}$ d) $\frac{1}{x + vt}$

212. 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) 2:1 b) 3:4 c) 3:2 d) 1:3

213. It is possible to distinguish between the transverse and longitudinal waves by studying the property of

a) Interference b) Diffraction c) Reflection d) Polarisation

214. A wire under tension vibrates with a fundamental frequency of 600 Hz. If the length of the wire is doubled, the radius is halved and the wire is made to vibrate under one-ninth the tension. Then the fundamental frequency will become
a) 400 Hz b) 600 Hz c) 300 Hz d) 200 Hz

215. An underwater sonar source operating at a frequency of 60 kHz directs its beam towards the surface. If the velocity of sound in air is 330 m/s, the wavelength and frequency of waves in air are:
a) 5.5 mm, 60 kHz b) 330 m, 60 kHz c) 5.5 mm, 20 kHz d) 5.5 mm, 80 kHz

216. A man sets his watch by the sound of a siren placed at a distance 1 km away. If the velocity of sound is 330 m/s
a) His watch is set 3 sec. faster b) His watch is set 3 sec. slower
c) His watch is set correctly d) None of the above

217. When a tuning fork produces sound waves in air, which one of the following is same in the material of tuning fork as well as in air
a) Wavelength b) Frequency c) Velocity d) Amplitude

218. The instantaneous displacement of a simple harmonic oscillator is given by= $a\cos\left[\omega t+\frac{\pi}{4}\right]$. Its speed will be maximum at the time
a) $\frac{2\pi}{\omega}$ b) $\frac{\omega}{2\pi}$ c) $\frac{\omega}{\pi}$ d) $\frac{\pi}{4\omega}$

219. When temperature increases, the frequency of a tuning fork
a) Increases b) Decreases
c) Remains same d) Increases or decreases depending on the material

220. Consider the three waves, z_1, z_2 and z_3 as
$z_1 = A\sin(kx-\omega t)$
$z_2 = A\sin(kx+\omega t)$
$z_3 = A\sin(kx-\omega t)$
Which of the following represent a standing wave?
a) z_1+z_2 b) z_2+z_3 c) z_3+z_1 d) $z_1+z_2+z_3$

221. When we hear a sound, we can identify its source from
a) Amplitude of sound b) Intensity of sound
c) Wavelength of sound d) Overtones present in the sound

222. A string of 7 m length has a mass of 0.035 kg. If tension in the string is 60.5 N, then speed of a wave on the string is
a) 77 m/s b) 102 m/s c) 110 m/s d) 165 m/s

223. A string of length 2m is fixed at both ends. If this string vibrates in its fourth normal mode with a frequency of 500 Hz, then the waves would travel on it with a velocity of
a) 125 ms^{-1} b) 250 ms^{-1} c) 500 ms^{-1} d) 1000 ms^{-1}

224. A pipe open at both the ends produce a note of fundamental frequency v_1 When the pipe is kept with $\frac{3}{4}$th of its length in water, it produces a note of fundamental frequency v_2. The ration of $\frac{v_1}{v_2}$ is
a) $\frac{4}{3}$ b) $\frac{3}{4}$ c) 2 d) $\frac{1}{2}$

225. The frequency of a rod is 200 Hz. If the velocity of sound in air is 340 ms^{-1}, the wavelength of the sound produced is
a) 1.7 cm b) 6.8 cm c) 1.7 m d) 6.8 m

226. Velocity of sound in air
I. increases with temperature
II. Decreases with temperature
III. Increase with pressure
IV. Is independent of pressure

V. 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

227. In stationary waves, distance between a node and its nearest antinode is 20 cm. The phase difference between two particles having a separation of 60 cm will be

a) Zero
b) $\pi/2$
c) π
d) $3\pi/2$

228. The source of sound generating a frequency of 3kHz reaches an observer with a speed of 0.5 times, the velocity of sound in air. The frequency heard by the observer is

a) 1 kHz
b) 2 kHz
c) 4 kHz
d) 6 kHz

229. Equation of a progressive wave is given by $y = a\sin\pi\left[\frac{t}{2} - \frac{x}{4}\right]$, where t is in seconds and x is in meters. The distance through which the wave moves in 8 sec is (in meter)

a) 8
b) 16
c) 2
d) 4

230. The equation of a wave on a string of liner mass density 0.04 kgm^{-1} is given by $y = 0.02(m)\sin\left[2\pi\left(\frac{t}{0.04(s)} - \frac{x}{0.50(m)}\right)\right]$. the tension in the string is

a) 4.0N
b) 12.5N
c) 0.5N
d) 6.25N

231. If wavelength of a wave is $\lambda = 6000\text{Å}$. Then wave number will be

a) $166 \times 10^3 m^{-1}$
b) $16.6 \times 10^{-1} m^{-1}$
c) $1.66 \times 10^6 m^{-1}$
d) $1.66 \times 10^7 m^{-1}$

232. A string of linear density 0.2 kgm^{-1} is stretched with a force of 500 N. A transverse wave of length 4.0 m and amplitude $(1/\lambda)$ metre is traveling along. Then the speed of the wave is

a) 50ms^{-1}
b) 62.5ms^{-1}
c) 2500ms^{-1}
d) 12.5ms^{-1}

233. A stone is dropped in a well which is 19.6m deep. Echo sound is heard after 2.06 sec (after dropping) then the velocity of sound is

a) 332.6 m/sec
b) 326.7 m/sec
c) 300.4 m/sec
d) 290.5 m/sec

234. In a resonance tube the first resonance with a tuning fork occurs at 16 cm and second at 49 cm. If the velocity of sound is 330 m/s, the frequency of tuning fork is

a) 500
b) 300
c) 330
d) 165

235. A tuning fork vibrates with 2 beats in 0.04 second. The frequency of the fork is

a) 50 Hz
b) 100 Hz
c) 80 Hz
d) None of these

236. A standing wave is represented by $Y = A\sin(100t)\cos(0.01x)$

Where Y and A are in $millimetre$, t is in seconds and x is in $metre$. The velocity of wave is

a) $10^4 m/s$
b) $1\ m/s$
c) $10^{-4} m/s$
d) Not derivable from above data

237. Stationary waves of frequency 300 Hz are formed in a medium in which the velocity of sound is 1200 $metre/sec$. The distance between a node and the neighbouring antinode is

a) 1 m
b) 2 m
c) 3 m
d) 4 m

238. Two closed organ pipes of length 100 cm and 101 cm produce 16 beats in 20 sec. When each pipe is sounded in its fundamental mode calculate the velocity of sound

a) 303 ms^{-1}
b) 332 ms^{-1}
c) 323.2 ms^{-1}
d) 300 ms^{-1}

239. The fundamental frequency of a closed pipe is 220 Hz. If $\frac{1}{4}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is

a) 220 Hz
b) 440 Hz
c) 880 Hz
d) 1760 Hz

240. A fork of unknown frequency gives four beats s^{-1} when sounded with another of frequency 256. The fork is now loaded with a piece of wax and again four beats s^{-1} are heard. Then the frequency of the unknown fork is

a) 256 Hz
b) 252 Hz
c) 264 Hz
d) 260 Hz

241. Which of the following equations represents a wave?

a) $y = A\sin\omega t$ b) $y = A\cos kx$
c) $y = A\sin(at - dx + c)$ d) $y = A(\omega t - kx)$

242. A person feels 2.5% difference of frequency of a motor-car horn. If the motor-car is moving to the person and the velocity of sound is 320 m/sec, then the velocity of car will be
a) 8 m/s (approx.) b) 800 m/s c) 7 m/s d) 6m/s (approx.)

243. A string is producing transverse vibration whose equation is $y = 0.021\sin(x + 30t)$, Where x and y are in meters and t is in seconds. If the linear density of the string is $1.3 \times 10^{-4} kg/m$, then the tension in the string is N will be
a) 10 b) 0.5 c) 1 d) 0.117

244. a segment of wire vibrates with a fundamental frequency of 450 Hz under a tension of 9 kg-wt. then tension at which the fundamental frequency of the same wire becomes 900 Hz is
a) 36 kg-wt b) 27 kg-wt c) 18 kg-wt d) 72 kg-wt

245. An organ pipe P closed at one end vibrates in its first harmonic. Another organ pipe Q open at both ends vibrates in its third harmonic. When both are in resonance with a tuning fork, the ratio of the length of P to that of Q is
a) 1/2 b) 1/4 c) 1/6 d) 1/8

246. The apparent frequency of a note is 200 Hz, when a listener is moving with a velocity of 40 ms^{-1} towards a stationary source. When he moves away from the same source with the same speed, the apparent frequency of the same notes is 160 Hz. The velocity of sound in air in $ms^{-1}$is
a) 340 b) 330 c) 360 d) 320

247. Two waves having the intensities in the ratio of 9 : 1 produce interference. The ratio of maximum to the minimum intensity, is equal to
a) 2 : 1 b) 4 : 1 c) 9 : 1 d) 10 : 8

248. In a resonance pipe the first and second resonance are obtained with at depth 22.7 cm and 70.2 cm respectively. What will be the correction?
a) 1.05 cm b) 115.5 cm c) 92.5 cm d) 113.5 cm

249. The equation for spherical progressive wave is (where r is the distance from the source)
a) $y = a\sin(\omega t - kx)$ b) $y = \frac{a}{\sqrt{r}}\sin(\omega t - kx)$ c) $y = \frac{a}{2}\sin(\omega t - kx)$ d) $y = \frac{a}{r}\sin(\omega t - kx)$

250. Learned Indian classical vocalists do not like the accompaniment of a harmonium because
a) Intensity of the notes of the harmonium is too large
b) Notes of the harmonium are too shrill
c) Diatonic scale is used in the harmonium
d) Tempered scale is used in the harmonium

251. Which of the following is not the transverse wave
a) X-rays b) γ-rays c) Visible light wave d) Sound wave in gas

252. A hollow pipe of length 0.8m is closed a one end. At its open end a 0.5 m long uniform string is vibrating in its second harmonic and it resonates with the fundamental frequency of the pipe. If the tension in the wire is 50N and the speed of sound 320 ms^{-1}, the mass of the string is
a) 5 g b) 10 g c) 20 g d) 40 g

253. A metal wire of liner mass density of 9.8 $gm^{-1}$is stretched with a tension of kg-wt between two rigid supports 1 m 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 sources is
a) 50 Hz b) 100 Hz c) 200 Hz d) 25 Hz

254. In an experiment with sonameter a tuning fork of frequency 256 Hz resonates with a length of 25 cm and another tuning fork resonates with a length of 16 cm. tension of the string remaining constant the frequency of the second tuning fork is
a) 163.84 Hz b) 400 Hz c) 320 Hz d) 204.8 Hz

255. On producing the waves of frequency 1000 Hz in a Kundt's tube, the total distance between 6 successive nodes is 85 cm. Speed of sound in the gas filled in the tube is

a) 330 m/s b) 340 m/s c) 350 m/s d) 300 m/s

256. The equation of stationary wave along a stretched string is given by $y = 5\sin\frac{\pi x}{3}\cos 40\pi t$, where x and y are in cm and t in second. The separation between two adjacent nodes is

a) 1.5 cm b) 3 cm c) 6 cm d) 4 cm

257. The equation of a progressive wave can be given by y=15 sin (660 πt-0.02 πx) cm. the frequency of the wave is

a) 330 Hz b) 342 Hz c) 365 Hz d) 660 Hz

258. The displacement y of a particle in a medium can be expressed as $y = 10^{-6}\sin\left(100t + 20x + \frac{\pi}{4}\right)$m, where t is in second and x in metre. The speed of the wave is

a) 2000 ms^{-1} b) 5 ms^{-1} c) 20 ms^{-1} d) 5π ms^{-1}

259. Two sound waves having a phase difference of 60^o have path difference of

a) 2λ b) $\lambda/2$ c) $\lambda/6$ d) $\lambda/3$

260. A transverse wave is represented by the equation

$y = y_0\sin\frac{2\pi}{\lambda}(vt - x)$

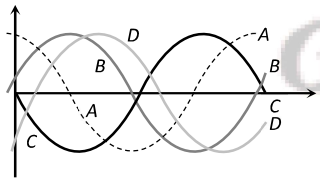
For what value of λ, the maximum particle velocity equal to two times the wave velocity

a) $\lambda = 2\pi y_0$ b) $\lambda = \pi y_0/3$ c) $\lambda = \pi y_0/2$ d) $\lambda = \pi y_0$

261. Three sound waves of equal amplitude have frequencies (v-1),v,(v+1). They superpose to give beat. The number of beats produced per second will be

a) 4 b) 3 c) 2 d) 1

262. Which of the following curves represents correctly the oscillation given by $y = y_0\sin(\omega t - \phi)$, where $0 < \phi < 90$



a) A b) B c) C d) D

263. Quality depends on

a) Intensity b) Loudness c) Timbre d) Frequency

264. A hollow cylinder with both sides open generates a frequency f in air. When the cylinder vertically immersed into water by half its length the frequency will be

a) f b) $2f$ c) $f/2$ d) $f/4$

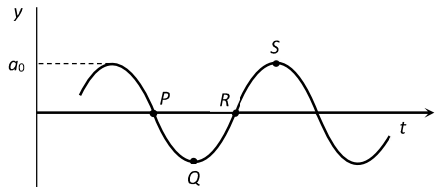
265. If the phase difference between two sound waves of wavelength λ is 60^o, the corresponding path difference is

a) $\frac{\lambda}{6}$ b) $\frac{\lambda}{2}$ c) 2λ d) $\frac{\lambda}{4}$

266. A tuning fork produces waves in a medium. If the temperature of the medium changes, then which of the following will change

a) Amplitude b) Frequency c) Wavelength d) Time-period

267. A wave motion has the function $y = a_0\sin(\omega t - kx)$. The graph in figure shows how the displacement y at a fixed point varies with time t. Which one of the labelled points shows a displacement equal to that at the position $x = \frac{\pi}{2k}$ at time $t = 0$



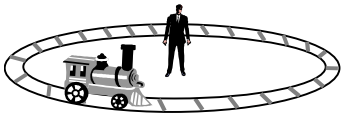
a) P b) Q c) R d) S

268. The equation of stationary wave along a stretched string is given by $y = 5\sin\frac{\pi x}{3}\cos 40\pi t$ where x and y are in centimetre and t in second. The separation between two adjacent nodes is :
a) 6 cm b) 4 cm c) 3 cm d) 1.5 cm

269. A train is moving at $30ms^{-1}$ in still air. The frequency of the locomotive whistle is 500 Hz and the speed of sound is $345ms^{-1}$. The apparent wavelength of sound in front of and behind the locomotive are respectively
a) $0.80m, 0.63m$ b) $0.63m, 0.80m$ c) $0.50m, 0.85m$ d) $0.63m, 0.75m$

270. A tuning fork and a sonometer wire were sounded together and produce 4 beats per second. When the length of sonometer wire is 95 cm or 100 cm, the frequency of the tuning fork is
a) 156 Hz b) 152 Hz c) 148 Hz d) 160 Hz

271. An engine is moving on a circular track with a constant speed. It is blowing a whistle of frequency 500 Hz. The frequency received by an observer standing stationary at the centre of the track is



a) 500 Hz b) More than 500 Hz
c) Less than 500 Hz d) More or less than 500 Hz depending on the actual speed of the engine

272. If the frequency of human heart beat is 1.25 Hz, the number of heart beats in 1 minute is
a) 80 b) 65 c) 90 d) 75

273. A boy is walking away from a wall towards an observer at a speed of 1 $metre/sec$ and blows a whistle whose frequency is 680 Hz. The number of beats heard by the observer per second is (Velocity of sound in air = 340 $metres/sec$)
a) Zero b) 2 c) 8 d) 4

274. The minimum distance of reflector surface from the source for listening the echo of sound is
a) 28 m b) 18 m c) 19 m d) 16.5 m

275. If two waves having amplitudes $2A$ and A and same frequency and velocity, propagate in the same direction in the same phase, the resulting amplitude will be
a) $3A$ b) $\sqrt{5}A$ c) $\sqrt{2}A$ d) A

276. The extension in a string obeying Hooke's law is$x$. The speed of transverse waves in the stretched is$v$. If the extension in the string is increased to 1.5 x, the speed of transverse waves in it will be
a) 1.22 v b) 0.61 v c) 1.5 v d) 0.75 v

277. Two wires are in unison. If the tension in one of the wires is increased by 2%, 5 beats are produced per second. The initial frequency of each wire is
a) 200 Hz b) 400 Hz c) 500 Hz d) 1000 Hz

278. A travelling wave passes a point of observation. At this point, the time interval between successive crests is 0.2 seconds and
a) The wavelength is 5 m b) The frequency is 5 Hz
c) The velocity of propagation is 5 m/s d) The wavelength is 0.2 m

279. In stationary wave
a) Strain is maximum at nodes b) Strain is maximum at antinodes

c) Strain is minimum at nodes
d) Amplitude is zero at all the points

280. Angle between wave velocity and particle velocity of a longitudinal wave is
a) 90^o b) 60^o c) 0^o d) 120^o

281. The phase difference between the two particles situated on both the sides of a node is
a) $0°$ b) $90°$ c) $180°$ d) $360°$

282. A sine wave has an amplitude A and a wavelength λ.Let v be the wave velocity, and V be maximum velocity of a particle in the medium
a) V cannot be equal to v
b) $V - v$,if $A = \lambda/2\pi$
c) $V - v$,if $A = 2\pi\lambda$
d) $V - v$,if $\lambda = A/\pi$

283. In a sinusoidal wave, the time required for a particular point to move from maximum displacement to zero displacement is 0.170 second. The frequency of the wave is
a) 1.47 Hz b) 0.36 Hz c) 0.73 Hz d) 2.94 Hz

284. Two sirens situated one kilometer apart are producing sound of frequency 330 Hz. An observer starts moving from one siren to the other with a speed of 2 m/s. If the speed of sound be 330 m/s, what will be the beat frequency heard by the observer
a) 8 b) 4 c) 6 d) 1

285. Three waves of equal frequency having amplitudes 10 μm, 4μm and 7 μm arrive at a given point with successive phase difference of $\pi/2$. The amplitude of the resulting wave in μm is given by
a) 7 b) 6 c) 5 d) 4

286. A stone is dropped into a well. If the depth of water below the top be h and velocity of sound in air be v, the time after which splash of sound is heard is
a) $\sqrt{\frac{2h}{g}} + \frac{h}{v}$ b) $\sqrt{\frac{2h}{g}} - \frac{h}{v}$ c) $\sqrt{\frac{2h}{g}}$ d) $\sqrt{\frac{2h}{g}} \times \frac{h}{v}$

287. A 1 cm long string vibrates with fundamental frequency of 256 Hz. If the length is reduced to $\frac{1}{4}cm$ keeping the tension unaltered, the new fundamental frequency will be
a) 64 b) 256 c) 512 d) 1024

288. A train moves towards a stationary observer with speed34 ms^{-1}. The train sounds a whistle and its frequency registered by the observer isv_1. If the train's speed is reduced to17 ms^{-1}, the frequency registered isv_2. If the speed of sound is 340 ms^{-1}, then the ratio $v_1/v_2$is
a) 2 b) 1/2 c) 18/19 d) 19/18

289. In a sinusoidal wave, the time required for a particular point to move from maximum displacement to zero displacement is 0.14s. the frequency of the wave is
a) 0.42 Hz b) 2.75 Hz c) 1.79 Hz d) 0.56 Hz

290. A source of frequency n given 5 beats s^{-1}, when sounded with a source of frequency 200 s^{-1}. The second harmonic (2n) gives 10 beats s^{-1}, when sounded with a source of frequency 420 s^{-1}. n is equal to
a) 200 s^{-1} b) 205 s^{-1} c) 195 s^{-1} d) 210 s^{-1}

291. A source of sound is moving with constant velocity of 20 m/s emitting a note of frequency 1000 Hz. The ratio of frequencies observed by a stationary observer while the source is approaching him and after it crosses him will be
(Speed of sound $v = 340\ m/s$)
a) 9 : 8 b) 8 : 9 c) 1 : 1 d) 9 : 10

292. Radar waves are sent towards a moving aeroplane and the reflected wave are received. When the aeroplane is moving towards the radar, the wavelength of the wave
a) Decreases
b) Increases
c) Remains the same
d) Sometimes increases or decreases

293. A bat flies at a steady speed of 4 ms^{-1} emitting a sound of $f = 90 \times 10^3$ Hz. It is flying horizontally towards a vertical wall. The frequency of the reflected sound as defected by the bat will be (take velocity of sound in air as 330 ms^{-1})
a) 88.1×10^3Hz b) 87.1×10^3Hz c) 92.1×10^3Hz d) 89.1×10^3Hz

294. If you set up the seventh harmonic on a string fixed at both ends, how many nodes and antinodes are set up in it
a) 8,7 b) 7,7 c) 8,9 d) 9,8

295. A table is revolving on its axis at 5 revolutions per second. A sound source of frequency 1000 Hz is fixed on the table at 70 cm from the axis. The minimum frequency heard by a listener standing at a distance from the table will be (speed of sound 352ms^{-1})
a) 1000 Hz b) 1066 Hz c) 941 Hz d) 352 Hz

296. The path difference between 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) $\frac{2\pi}{\lambda}\left(\phi - \frac{\pi}{2}\right)$ d) $\frac{2\pi}{\lambda}(\phi)$

297. A note has a frequency 128 Hz. The frequency of a note two octaves higher than it is
a) 256 Hz b) 64 Hz c) 32 Hz d) 512 Hz

298. Which one of the following statements is true
a) Both light and sound waves in air are longitudinal
b) Both light and sound waves can travel in vacuum
c) Both light and sound waves in air are transverse
d) The sound waves in air are longitudinal while the light waves are transverse

299. 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) 16 kg-wt b) 12 kg-wt c) 24 kg-wt d) 4 kg-wt

300. A source of sound of frequency 256 Hz is moving towards a wall with a velocity of 5ms^{-1}. Velocity of sound is 330ms^{-1}.The number of beats s^{-1} heard by an observer standing between the source and the wall is nearly
a) $\frac{256 \times 330}{325} - \frac{256 \times 330}{325}$ b) $256 - \frac{256 \times 330}{325}$
c) $\frac{256 \times 330}{325} \times \frac{256 \times 330}{335}$ d) $\frac{256 \times 330}{325} - 256$

301. When two wave of almost equal frequencies n_1 *and* $n_2$are produced simultaneously, then the time interval between successive maxima is
a) $\frac{1}{n_1 - n_2}$ b) $\frac{1}{n_1} - \frac{1}{n_2}$ c) $\frac{1}{n_1} + \frac{1}{n_2}$ d) $\frac{1}{n_1 + n_2}$

302. The equation of transverse wave is given by
$y = 100 \sin \pi(0.04z - 2t)$
Where y and z are in cm and t is in seconds. The frequency of the wave in Hz is
a) 1 b) 2 c) 25 d) 100

303. The displacement of a particle executing periodic motion is given by $y = 4\cos^2(t/2)\sin(1000t)$. This expression may be considered to be a result of superposition of
a) Two waves b) Three waves c) Four waves d) Five waves

304. Two sources produce sound waves of equal amplitudes and travelling along the same direction producing 18 beats in 3 seconds. If one source has a frequency of 341 Hz, the frequency of the other source may be
a) 329 or 353 Hz b) 335 or 347 Hz c) 338 or 344 Hz d) 332 or 350 Hz

305. When a sound wave goes from one medium to another, the quantity that remains unchanged is
a) Frequency b) Amplitude c) Wavelength d) Speed

306. When a string is divided into three segments of length ℓ_1, ℓ_2 and ℓ_3 the fundamental frequencies of these three segments are v_1, v_2 and v_3 respectively. The original fundamental frequency (v) of the string is
a) $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$ b) $v = v_1 + v_2 + v_3$
c) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$ d) $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

307. A source is moving towards a stationary observer, so that the apparent frequency increases by 50%. If velocity of sound is $330ms^{-1}$, then velocity of source is
a) $220ms^{-1}$ b) $180ms^{-1}$ c) $150ms^{-1}$ d) $110ms^{-1}$

308. A whistle of frequency 540 Hz rerates in a horizontal circle of radius 2m at an angular speed of 15rads^{-1}. The highest frequency heard by a listener at rest with respect to the center of circle (velocity of sound in air $=330ms^{-1}$)
a) 590 Hz b) 594 Hz c) 598 Hz d) 602 Hz

309. The ratio of densities of nitrogen and oxygen is 14: 16. The temperature at which the speed of sound in nitrogen will be same at that in oxygen at 55°C is
a) 35°C b) 48°C c) 65°C d) 14°C

310. The wavelength of a wave is 990 cm and that of other is 100 cm. speed of sound is 396 m/s. The number of beats heard is
a) 4 b) 5 c) 1 d) 8

311. Beats are produced when two progressive waves of frequency 256 Hz ad 260 Hz superpose. Then the resultant amplitude changes periodically with frequency of
a) 256 Hz b) 260 Hz c) $\frac{256-260}{2}$ Hz d) 4 Hz

312. If T is the reverberation time of an auditorium of volume V then
a) $T \propto \frac{1}{V}$ b) $T \propto \frac{1}{V^2}$ c) $T \propto V^2$ d) $T \propto V$

313. A wave equation is given by $y = 4\sin\left[\pi\left(\frac{t}{5} - \frac{x}{9} + \frac{1}{6}\right)\right]$ where x is in cm and t is in second. Which of the following is true?
a) $\lambda = 18\ cm$ b) $v = 4ms^{-1}$ c) a=0.4 cm d) f= 50 Hz

314. At a certain instant a stationary transverse wave is found to have maximum kinetic energy. The appearance of string at that instant is
a) Sinusoidal shape with amplitude $\frac{a}{3}$ b) Sinusoidal shape with amplitude $\frac{a}{2}$
c) Sinusoidal shape with amplitude a d) Straight line

315. The frequency of a tuning fork A is 2% more than the frequency of a standard tuning fork. The frequency of the same standard tuning fork. If 6 beats s^{-1} are heard when the two tuning fork A and B are excited, the frequency of A is
a) 120 Hz b) 122.4 Hz c) 116.4 Hz d) 130 Hz

316. Equation of motion in the same direction are given by
$y_1 = 2a\sin(\omega t - kx)$ and $y_2 = 2a\sin(\omega t - kx - \theta)$
The amplitude of the medium particle will be
a) $2a\cos\theta$ b) $\sqrt{2}a\cos\theta$ c) $4a\cos\theta/2$ d) $\sqrt{2}a\cos\theta/2$

317. A sounding source of frequency 500 Hz moves towards a stationary observer with a velocity30 ms^{-1}. If the velocity of sound in air is 330 ms^{-1}, find frequency heard by the observer.
a) 500 Hz b) 550 Hz c) 355 Hz d) 55.5 Hz

318. A racing car moving towards a cliff sounds its horn. The drivers observe that the sound reflected from the cliff has a pitch one octave higher than the actual sound of the horn. If v=the velocity of sound, the velocity of the car is
a) $v/\sqrt{2}$ b) $v/2$ c) $v/3$ d) $v/4$

319. The stationary wave $y = 2a \sin kx \cos \omega t$ in a closed organ pipe is the result of the superposition of $y = a \sin(\omega t - kx)$ and
a) $y = -a \cos(\omega t + kx)$ b) $y = -a \sin(\omega t + kx)$ c) $y = a \sin(\omega t + kx)$ d) $y = a \cos(\omega t + kx)$

320. Two tuning forks A and B vibrating simultaneously produce 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 b) 507 c) 517 d) 522

321. If v is the speed of sound in air then the shortest length of the closed pipe which resonates to a frequency n
a) $\frac{v}{4n}$ b) $\frac{v}{2n}$ c) $\frac{2n}{v}$ d) $\frac{4n}{v}$

322. Beats are produced by frequencies $v_1 and\ v_2 (v_1 >_2)$. The duration of time between two successive maximum or minima is equal to
a) $\frac{1}{v_1 + v_2}$ b) $\frac{2}{v_1 - v_2}$ c) $\frac{2}{v_1 + v_2}$ d) $\frac{1}{v_1 - v_2}$

323. A point source emits sound equally in all directions in a non-absorbing medium. Two points P and Q are at distance of 2m and 3m respectively from the source. The ratio of the intensities of the waves at P and Q is
a) 9:4 b) 2:3 c) 3:2 d) 4:9

324. The intensity of sound gets reduced by 10% on passing through a slab. The reduction in intensity on passing through three consecutive slab is
a) 30% b) 27.1% c) 20% d) 36%

325. Sounds wave transfer
a) Only energy not momentum b) Energy
c) Momentum d) Both (a) and (b)

326. A person carrying a whistle emitting continuously a note of 272 Hz is running towards a reflecting surface with a speed of 18 $km/hour$. The speed of sound in air is $345 ms^{-1}$. The number of beats heard by him is
a) 4 b) 6 c) 8 d) 3

327. The equation of wave is represented by $Y = 10^{-4} \sin\left[100t - \frac{x}{10}\right] m$, then the velocity of wave will be
a) 100ms^{-1} b) 4ms^{-1} c) 1000ms^{-1} d) zero

328. Two whistles A and B produce notes of frequencies 660 Hz and 596 Hz respectively. There is a listener at the mid-point of the line joining them. Now the whistle B and the listener start moving with speed 30 m/s away from the whistle A. If speed of sound be 330 m/s, how many beats will be heard by the listener
a) 2 b) 4 c) 6 d) 8

329. A simple wave motion represented by $y = 5(\sin 4\pi t + \sqrt{3} \cos 4\pi t)$. Its amplitude is
a) 5 b) $5\sqrt{3}$ c) $10\sqrt{3}$ d) 10

330. A sound wave of frequency v propagating through air with a velocity c, is reflected from a surface which is moving away from the source with a constant speed v. the frequency of the reflected wave, measured by the observed at the position of the source, is
a) $\frac{v(c - v)}{c + v}$ b) $\frac{v(C + v)}{c - v}$ c) $\frac{v(c + 2v)}{c + v}$ d) $\frac{v(c - v)}{c - 2v}$

331. At a moment is a progressive wave, the phase of a particle executing SHM is
$\frac{\pi}{3}$
Then the phase of the particle 15 cm ahead and at the
$\frac{T}{2}$
Will be, if the wavelength 60 cm
a) $\frac{\pi}{2}$ b) $\frac{2\pi}{3}$ c) Zero d) $\frac{5\pi}{6}$

332. Fundamental frequency of an open pipe of length 0.5 m is equal to the frequency of the first overtone of a closed pipe of length l. The value of l_c is (m)
a) 1.5 b) 0.75 c) 2 d) 1

333. A wave is represented by the equation : $y = a\sin(0.01x - 2t)$ where a and x are in cm. velocity of propagation of wave is
a) 10 cm/s b) 50 cm/s c) 100 cm/s d) 200 cm/s

334. In a stationary wave, all particles are
a) At rest at the same time twice in every period of oscillation
b) At rest at the same time only once in every period of oscillation
c) Never at rest at the same time
d) Never at rest at all

335. The tension in a piano wire is 10N. What should be the tension in the wire to produce a note of double the frequency
a) 5 N b) 20 N c) 40 N d) 80 N

336. Two sound sources emitting sound each of wavelength λ are fixed at a given distance apart. A listener moves with a velocity u along the line joining the two sources. The number of beats heard by him per second is
a) $2u/\lambda$ b) u/λ c) $\frac{u}{3\lambda}$ d) $\frac{2\lambda}{u}$

337. Ultrasonic waves are those waves
a) To which man can hear b) Man can't hear
c) Are of high velocity d) Of high amplitude

338. A train approaches a stationary observer, the velocity of train being $\frac{1}{20}$ of the velocity of sound. A sharp blast is blown with the whistle of the engine at equal intervals of a second. The interval between the successive blasts as heard by the observer is
a) $\frac{1}{20}s$ b) $\frac{1}{20}$min c) $\frac{19}{20}s$ d) $\frac{10}{20}$min

339. In a resonance column cist and second resonance are obtained at depths 22.7 cm and 70.2 cm. The third resonance will be obtained at a depth
a) 117.7 cm b) 92.9 cm c) 115.5 cm d) 113.5 cm

340. A source and listener are both moving towards each other with speed $\frac{v}{10}$, where v is the speed of sound. If the frequency of the note emitted by the source is f, the frequency heard by the listener would be nearly
a) 1.11 f b) 1.22 f c) f d) 1.27 f

341. Four wires of identical length, diameters and of the same material are stretched on a sonometre wire. If the ratio of their tensions is 1 : 4 : 9 : 16 then the ratio of their fundamental frequencies are
a) 16 : 9 : 4 : 1 b) 4 : 3 : 2 : 1 c) 1 : 4 : 2 : 16 d) 1 : 2 : 3 : 4

342. Consider ten identical sources of sound all giving the same frequency but having phase angles which are random. If the average intensity of each source is I_0, the average of resultant intensity I due to all these ten sources will be
a) $I = 100I_0$ b) $I = 10I_0$ c) $I = I_0$ d) $I = \sqrt{10}I_0$

343. The equation $\vec{\phi}(x,t) = \vec{j}\sin\left(\frac{2\pi}{\lambda}vt\right)\cos\left(\frac{2\pi}{\lambda}x\right)$ represents
a) Transverse progressive wave b) Longitudinal progressive wave
c) Longitudinal stationary wave d) Transverse stationary wave

344. The equation of a wave is 3cos π (50t-x). the wavelength of the wave is
a) 3 unit b) 2 unit c) 50 unit d) 47 unit

345. The phase difference between two points separated by $1m$ in a wire of frequency 120 Hz is 90°. The wave velocity is
a) 180 m/s b) 240 m/s c) 480 m/s d) 720 m/s

346. The speed of sound in a gas of density ρ at a pressure P is proportional to
a) $\left(\frac{p}{\rho}\right)^2$ b) $\left(\frac{P}{\rho}\right)^{3/2}$ c) $\sqrt{\frac{\rho}{P}}$ d) $\sqrt{\frac{P}{\rho}}$

347. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats/s are heard. Now, some tape is attached on the prong of the fork2. When the tuning fork are sounded again, 6 beats/s are heard. If the frequency of fork 1 is 200Hz, then what was the original frequency of fork 2?
a) 200 Hz b) 202 Hz c) 196 Hz d) 204 Hz

348. Two waves represented by the following equations are travelling in the same medium $y_1 = 5\sin 2\pi(75t - 0.25x)$, $y_2 = 10\sin 2\pi(150t - 0.50x)$
The intensity ratio I_1/I_2 of the two waves is
a) 1 : 2 b) 1 : 4 c) 1 : 8 d) 1 : 16

349. A source of sound emits waves with frequency f Hz and speed V m/sec. Two observers move away from this source in opposite directions each with a speed 0.2 V relative to the source. The ratio of frequencies heard by the two observers will be
a) 3 : 2 b) 2 : 3 c) 1 : 1 d) 4 : 10

350. Two waves represented by y=a sin (ωt - kx) and y= a cos (ωt-kx) are superposed. The resultant wave will have an amplitude
a) a b) $\sqrt{2}a$ c) 2a d) Zero

351. A resonance air column of length 20 cm resonated with a tuning fork of frequency 250 Hz. The speed of sound in air is
a) 300 m/s b) 200 m/s c) 150 m/s d) 75 m/s

352. When a train approaches a stationary observer, the apparent frequency of the whistle is n' and when the same train recedes away from the observer, the apparent frequency is$n$". Then the apparent frequency n when the observer moves with the train is
a) $n = \frac{n' + n}{2}$ b) $n = \sqrt{n'n''}$ c) $n = \frac{2n'n''}{n' + n''}$ d) $n = \frac{2n'n''}{n' - n''}$

353. A wave motion is described by $y(x,t) = a\sin(kx - wt)$. Then the ratio of the maximum particle velocity to the wave velocity is
a) ωa b) $\frac{1}{ka}$ c) $\frac{\omega}{k}$ d) ka

354. Doppler shift in frequency does not depend upon
a) The frequency of the wave produced b) The velocity of the source
c) The velocity of the observer d) Distance from the source to the listener

355. An air column in a pipe, which is closed at one end, will be in resonance with a vibrating body of frequency 166 Hz, if the length of the air column is
a) 2.00 m b) 1.50 m c) 1.00 m d) 0.50 m

356. Two organ pipes both closed at one end have length $l$and$(l + \Delta l)$. Neglect ed correction. If velocity of sound I air is v, the number of beats s^{-1} is
a) $v/4l$ b) $v/2l$ c) $\frac{v}{4l^2}(\Delta l)$ d) $\frac{v}{2l^2}(\Delta l)$

357. The equation of a wave on a string of linear mass density 0.04 kgm^{-1} is given by $y = 0.02(m)\sin\left[2\pi\left(\frac{t}{0.04(s)} - \frac{x}{0.50(m)}\right)\right]$. The tension in the string is
a) 6.25 N b) 4.0 N c) 12.5 N d) 0.5 N

358. The echo of a gun shot is heard 8 sec. after the gun is fired. How far from him is the surface that reflects the sound (velocity of sound in air = 350 m/s)
a) 1400 m b) 2800 m c) 700 m d) 350 m

359. If v is the speed of sound in air then the shortest length of the closed pipe which resonates to a frequency v, is
a) $\frac{v}{2v}$ b) $\frac{v}{4v}$ c) $\frac{4v}{v}$ d) $\frac{2v}{v}$

360. If in an experiment for determination of velocity of sound by resonance tube method using a tuning fork of 512 Hz, first resonance was observed at 30.7 cm and second was obtained at 63.2 cm, then maximum possible error in velocity of sound is (consider actual speed of sound in air is 332 m/s)
a) 204 cm/sec b) 110 cm/sec c) 58 cm/sec d) 80 cm/sec

361. An object producing a pitch of 400 Hz flies past a stationary person. The object was moving in a straight line with a velocity200 ms^{-1}. What is the change in frequency noted by the person as the person as the object files past him?
a) 1440 Hz b) 240 Hz c) 1200 Hz d) 960 Hz

362. A wave of frequency 500 Hz has velocity 360 m/sec. The distance between two nearest points 60^{o} out of phase, is
a) 0.6 cm b) 12 cm c) 60 cm d) 120 cm

363. A standing wave is produced in a string fixed at both ends. In this case
a) All particles vibrate in phase
b) All antinodes vibrate in phase
c) All alternate antinodes vibrate in phase
d) All particles between two consecutive antinodes vibrate in phase

364. In a closed organ pipe the frequency of fundamental note is 50 Hz. The note of which of the following frequencies will not be emitted by it
a) 50 Hz b) 100 Hz c) 150 Hz d) None of the above

365. Two vibrating tuning forks produce progressive waves given by $y_1 = 4\sin 500\pi t \; and \; y_2 = \sin 50\pi t$. Number of beats produced per minute is
a) 360 b) 180 c) 3 d) 60

366. A racing car moving towards a cliff sounds its horn. The driver observes that the sound reflected from the actual sound of the horn. If v is velocity of sound, the velocity of the car is
a) $\frac{v}{\sqrt{2}}$ b) $\frac{v}{2}$ c) $\frac{v}{3}$ d) $\frac{v}{4}$

367. The superposing waves are represented by the following equations :
$y_1 = 5\sin 2\pi(10t - 0.1x)$, $y_2 = 10\sin 2\pi(20t - 0.2x)$
Ratio of intensities $\frac{I_{\max}}{I_{\min}}$ will be
a) 1 b) 9 c) 4 d) 16

368. Velocity of sound in air is
a) Faster in dry air than in moist air
b) Directly proportional to pressure
c) Directly proportional to temperature
d) Independent of pressure of air

369. A boat at anchor is rocked by waves whose crests are 100m apart and velocity is 25ms^{-1}. The boat bounces up once in every
a) 2500 s b) 75 s c) 4 s d) 0.25 s

370. A wave is given by $y = 3\sin 2\pi\left(\frac{t}{0.04} - \frac{x}{0.01}\right)$, where y is in cm. Frequency of wave and maximum acceleration of particle will be
a) $100Hz, 4.7 \times 10^3 cm/s^2$
b) $500Hz, 7.5 \times 10^3 cm/s^2$
c) $25Hz, 4.7 \times 10^4 cm/s^2$
d) $25Hz, 7.4 \times 10^4 cm/s^2$

371. The harmonic which are present in a pipe open at one end are
a) Odd harmonics
b) Even harmonics
c) Even as well as odd harmonics
d) None of these

372. Intensity level of sound of intensity I is 30 dB. The ratio $\frac{I}{I_0}$ is (Where I_0 is the threshold of hearing)
a) 3000 b) 1000 c) 300 d) 30

373. An open pipe is in resonance in 2nd harmonic with frequency v_1 Now one end of the tube is closed and frequency is increased to v_2 such that the resonance again occurs in nth harmonic. Choose the correct option.

a) $n = 3, v_2 = \frac{3}{4}v\_1$ b) $n = 3, v_2 - \frac{5}{4}v_1$ c) $n = 5, v_2 = \frac{5}{4}v_1$ d) $n = 5, v_2 = \frac{3}{4}v_1$

374. Light from two coherent sources of the same amplitude A and wavelength λ illuminates the screen. The intensity of the central maximum is I_0. If the sources were incoherent, the intensity at the same point will be

a) $4I_0$ b) $2I_0$ c) I_0 d) $I_0/2$

375. A progressive wave in a medium is represented by the equation $y = 0.1\sin\left(10\pi t - \frac{5}{11}\pi x\right)$ where y and x are in cm and t in second. The wavelength and velocity of the wave is

a) $\frac{5}{11}$cm, 31.4 cms^{-1} b) 4.4cm, 22 cms^{-1} c) 2.2cm, 11 cms^{-1} d) $\frac{11}{5}$cm, 22 cms^{-1}

376. The particles of a medium vibrate about their mean positions whenever a wave travels through that medium. The phase difference between the vibrations of two such particles

a) Varies with time b) Varies with distance separating them

c) Varies with time as well as distance d) Is always zero

377. The first overtone of a stretched wire of given length is 320 Hz. The first harmonic is

a) 320 Hz b) 160 Hz c) 480 Hz d) 640 Hz

378. The transverse displacement of a string fixed at both ends is given by $y = 0.06\sin\left(\frac{2\pi x}{3}\right)\cos(120\pi t)$ y and x are in metres and t in seconds. The wavelength and frequency of the two superposing waves are

a) $2m, 120\ Hz$ b) $\frac{2}{3}m, 60Hz$ c) $\frac{3}{2}m, 120Hz$ d) $3m, 60Hz$

379. The magnetic field in the plane electromagnetic field is given by

$B_y = 2\times10^{-7}\sin(0.5\times10^3 z + 1.5\times10^{11}t)T$

The expression for the electric field may be given by

a) $E_y = 2\times10^{-7}\sin(0.5\times10^3 z + 1.5\times10^{11}t)\ V/m$

b) $E_x = 2\times10^{-7}\sin(0.5\times10^3 z + 1.5\times10^{11}t)\ V/m$

c) $E_y = 60\sin(0.5\times10^3 z + 1.5\times10^{11}t)V/m$

d) $E_x = 60\sin(0.5\times10^3 z + 1.5\times10^{11}t)V/m$

380. How many times more intense is a 60 dB sound than a dB sound?

a) 1000 b) 2 c) 100 d) 4

381. The transverse displacement $y(x,t)$ of a wave on a string is given by $y(x,t) = e^{-(ax^2+bt^2+2\sqrt{ab}xt)}$ This represent 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 speed $\sqrt{\frac{a}{b}}$

382. Two closed pipes produce 10 beats per second when emitting their fundamental nodes. If their lengths are in ratio of 25 : 26. Then their fundamental frequency in Hz, are

a) 270, 280 b) 260, 270 c) 260, 250 d) 260, 280

383. The frequency of a sonometer wire is 100 Hz. When the weights producing the tension are completely immersed in water, the frequency becomes 80 Hz and on immersing the weights in a certain liquid, the frequency becomes 60 Hz. The specific gravity of the liquid is

a) 1.42 b) 1.77 c) 1.21 d) 1.82

384. An organ pipe, open at both ends produces 5 beats/s when vibrates with a source of frequency 200 Hz. The second of the same pipe produces 10 beats/s with a source of frequency 420 Hz. The frequency of source is

a) 195 Hz b) 205 Hz c) 190 Hz d) 210 Hz

385. The equation of the propagating wave is $y = 25\sin(20t + 5x)$, where y is displacement. Which of the following statements is not true

a) The amplitude of the wave is 25 units
b) The wave is propagating in positive x-direction
c) The velocity of the wave is 4 units
d) The maximum velocity of the particles is 500 units

386. Two sources of sound placed to each other, are emitting progressive waves given by $y_1 = 4\sin 600\pi t$ and $y_2 = 5\sin 608\pi t$. An observer located near these two sources of sound will hear
a) 4 beats per second with intensity ratio 25 : 16 between waxing and waning
b) 8 beats per second with intensity ratio 25 : 16 between waxing and waning
c) 8 beats per second with intensity ratio 81 : 1 between waxing and waning
d) 4 beats per second with intensity ratio 81 : 1 between waxing and waning

387. The velocity of sound is v_s in air. If the density of air is increased to 4 times, then the new velocity of sound will be
a) $\frac{v_s}{2}$ b) $\frac{v_s}{12}$ c) $12v_s$ d) $\frac{3}{2}v_s^2$

388. The displacement x(in meter) of a particle performing simple harmonic, motion is related to time t(in second) as $x = 0.05\cos\left(4\pi t + \frac{\pi}{4}\right)$.The frequency of the motion will be
a) 05 Hz b) 1.0 Hz c) 1.5 Hz d) 2.0 Hz

389. The fractional change in wavelength of light coming from a star is 0.014% what is its velocity?
a) $42 \times 10^3 \text{ms}^{-1}$ b) $3.8 \times 10^8 \text{ms}^{-1}$ c) $3.5 \times 10^3 \text{ms}^{-1}$ d) $4.2 \times 10^4 \text{ms}^{-1}$

390. A source of sound of frequency 90 vibrations/sec is approaching a stationary observer with a speed equal to 1/10 the speed of sound. What will be the frequency heard by the observer
a) 80 vibrations/sec b) 90 vibrations/sec c) 100 vibrations/sec d) 120 vibrations/sec

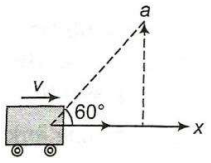
391. The equation $y = 0.15\sin 5x\cos 300t$, describes a stationary wave. The wavelength of the stationary wave is
a) Zero b) 1.256 $metres$ c) 2.512 $metres$ d) 0.628 $metre$

392. The frequency of a tuning fork is 384 per second and velocity of sound in air is 352 m/s. How far the sound has traversed while fork completes 36 vibration
a) 3 m b) 13 m c) 23 m d) 33 m

393. A closed organ pipe and an open pipe of same length produce 2 beats s^{-1} when they are set into vibrations together in fundamental mode. The length of open pipe is now halved and that of closed pipe is doubled. The number of beats produced will be
a) 7 b) 4 c) 8 d) 2

394. Air is blown at the mouth of a tube of length 25 cm and diameter equal to 2 cm open at both ends. If velocity of sound in air in 330ms^{-1}, the sound emitted will have all the frequency in the group
a) 330,990,1690 Hz b) 302,664,1320 Hz c) 660,1320,1980 Hz d) 660,100,3300 Hz

395. A car is moving along x-axis with a velocity v=20 m/s. it sounds a whistle of frequency 660 Hz. If the speed of sound is 340 m/s, the apparent frequency heard by the observer O (shown in the figure) is



a) 680 Hz b) 640 Hz c) 700 Hz d) 720 Hz

396. If the temperature increases, then what happens to the frequency of the sound produced by the organ pipe
a) Increases b) Decreases c) Unchanged d) Not definite

397. An open organ pipe has fundamental frequency 100 Hz. What frequency will be produced if its one end is closed?
a) 100,200,300..... b) 50,150,250..... c) 50,100, 200,300.... d) 50,100,150,200.....

398. Decibel is unit of
a) Intensity of light b) X-rays radiation capacity

c) Sound loudness d) Energy of radiation

399. A glass tube 1.5 m long and open at both ends, is immersed vertically in a water tank completely. A tuning fork of 660 Hz is vibrated and kept at the upper end of the tube and the tube is gradually raised out of water. The total number of resonances heard before the tube comes out of water, taking velocity of sound air 330 m/sec is

a) 12 b) 6 c) 8 d) 4

400. The minimum intensity of sound is zero at a point due to two sources of nearly equal frequencies, when

a) Two sources are vibrating in opposite phase

b) The amplitude of two sources are equal

c) At the point of observation, the amplitudes of two S.H.M. produced by two sources are equal and both the S.H.M. are along the same straight line

d) Both the sources are in the same phase

401. If vibrations of a string are to be increased by a factor of two, then tension in the string must be made

a) Half b) Twice c) Four times d) Eight times

402. A student determines the velocity of sound with the help of a closed organ pipe. If the observed length for fundamental frequency is 24.7 m, the length for third harmonic will be

a) 74.1 cm b) 72.7 cm c) 75.4 cm d) 73.1 cm

403. If sound wave travel from air to water, which of the following remain unchanged?

a) Velocity b) Wavelength c) Frequency d) Intensity

404. Two waves

$y_1 = A_1 \sin(\omega t - \beta_1), y_2 = A_2 \sin(\omega t - \beta_2)$

Superimpose to form a resultant wave whose amplitude is

a) $\sqrt{A_1^2 + A_2^2 + 2A_1A_2\cos(\beta_1 - \beta_2)}$ b) $\sqrt{A_1^2 + A_2^2 + 2A_1A_2\sin(\beta_1 - \beta_2)}$

c) $A_1 + A_2$ d) $|A_1 + A_2|$

405. Two waves are given by $y_1 = a\sin(\omega t - kx)$ and $y_2 = a\cos(\omega t - kx)$

The phase difference between the two waves is

a) $\pi/4$ b) π c) $\pi/8$ d) $\pi/2$

406. In a progressive wave, the distance between two consecutive crests is

a) $\frac{\lambda}{2}$ b) λ c) 2λ d) $\frac{2}{\lambda}$

407. If man were standing unsymmetrical between parallel cliffs, claps his hands and starts hearing a series of echoes at a intervals of 1 s. If speed of sound in air is $340 ms^{-1}$, the distance between two cliffs would be

a) 340m b) 510m c) 170m d) 680m

408. Two trains are moving towards each other with speeds of 20 m/s and 15 m/s relative to the ground. The first train sounds whistle of frequency 600 Hz, the frequency of the whistle heard by a passenger in the second train before the meets is (the speed of sound in air is 340 m/s)

a) 600 Hz b) 585 Hz c) 645 Hz d) 666 Hz

409. In Melde's experiment, the string vibrates in 4 loops when a 50g weight is placed in the pan of weight 15g. To make the string to vibrates in 6 loops the weight that has to be removed from the pan is

a) 0.0007 kg-wt b) 0.0021 kg-wt c) 0.036 kg-wt d) 0.0029 kg-wt

410. The electric field part of an electromagnetic wave in a medium is represented by $E_x = 0$;

$E_y = 2.5\frac{N}{C}\cos\left[\left(2\pi \times 10^6 \frac{rad}{m}\right)t - \left(\pi \times 10^{-2}\frac{rad}{s}\right)x\right]$;

$E_2 = 0$. The wave is

a) Moving along y direction with frequency $2\pi \times 10^6 Hz$ and wavelength 200 m

b) Moving along x direction with frequency $10^6 Hz$ and wavelength 100 m

c) Moving along x direction with frequency $10^6 Hz$ and wavelength 200 m

d) Moving along $-x$ direction with frequency $10^6 Hz$ and wavelength 200 m

411. The extension in a string obeying Hook's law is x. the speed of sound in the stretched string is v. if the extension in the string is increased to 1.5x, the speed of sound will be
a) 1.22v b) 0.61v c) 1.50v d) 0.75v

412. A pipe 30 cm long is open at both ends. Which harmonic mode of the pipe is resonantly excited by a 1.1 kHz source? (Take speed of sound in air = 330 ms^{-1})
a) First b) Second c) Third d) Fourth

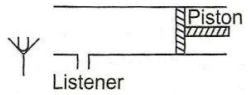
413. If two tuning forks A and B are sounded together, they produce 4 beats per second. A is then slightly loaded with wax, they produce 2 beats when sounded again. The frequency of A is 256. The frequency of B will be
a) 250 b) 252 c) 260 d) 262

414. Equation of motion in the same direction is given by $y_1 = A\sin(\omega t - kx)$, $y_2 = A\sin(\omega t - kx - \theta)$. The amplitude of the medium particle will be
a) $2A\cos\frac{\theta}{2}$ b) $2A\cos\theta$ c) $\sqrt{2}A\cos\frac{\theta}{2}$ d) $\sqrt{2}A\cos\theta$

415. A stretched string of length $\boldsymbol{l}$ fixes at both ends can sustain stationary waves of wavelength λ, given by
a) $\lambda = 2\boldsymbol{l}n$ b) $\lambda = \frac{\iota^2}{n}$ c) $\lambda = \frac{\iota^2}{2n}$ d) $\lambda = \frac{n^2}{2\iota}$

416. Two open organ pipes of length 25 cm and 25.5 cm produce 10 $beat/sec$. The velocity of sound will be
a) 255 m/s b) 250 m/s c) 350 m/s d) None of these

417. A long cylindrical tube carries a highly polished piston and has a side opening. A tuning fork of frequency n is sounded at the sound heard by the listener charges if the piston is moves in or out. At a particular position of the piston is moved through a distance of 9 cm, the intensity of sound becomes minimum, if the speed of sound is 360 m/s, the value of n is



a) 129.6 Hz b) 500 Hz c) 1000 Hz d) 2000 Hz

418. An open organ pipe is closed suddenly with the result that the second overtone of the closed pipe is found to be higher in frequency by 100 than the first overtone of the original pipe. Then the fundamental frequency of the open pipe is
a) $200s^{-1}$ b) $100s^{-1}$ c) 300 s^{-1} d) 250 s^{-1}

419. Two closed organ pipes, when sounded simultaneously gave 4 beats per sec. If longer pipe has a length of 1m. Then length of shorter pipe will be, (v = 300 m/s)
a) 185.5 cm b) 94.9 cm c) 90 cm d) 80 cm

420. 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 300ms^{-1}, the velocity of source is
a) 12ms^{-1} b) 1.5ms^{-1} c) 3ms^{-1} d) 6ms^{-1}

421. Two waves of same frequency and intensity superimpose with each other in opposite phases, then after superposition the
a) Intensity increases by 4 times b) Intensity increases by two times
c) Frequency increases by 4 times d) None of these

422. 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 measures 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

423. A tuning fork A produces 4 $beats/sec$ with another tuning fork B of frequency 320 Hz. On filing the fork A, 4 $beats/sec$ are again heard. The frequency of fork A, after filing is
a) 324 Hz b) 320 Hz c) 316 Hz d) 314 Hz

424. If L_1 and L_2 are the lengths of the first and second resonating air columns in a resonance tube, then the wavelength of the note produced is

a) $2(L_2 + L_1)$ b) $2(L_2 - L_1)$ c) $2\left(L_2 - \frac{L_1}{2}\right)$ d) $2\left(L_2 + \frac{L_1}{2}\right)$

425. A wave frequency us y=0.1 sin $[100\,\pi t - kx]$ and wave velocity is 100^{-1}, its wave number is equal to

a) 1m^{-1} b) 2m^{-1} c) πm^{-1} d) $2\pi\ \text{m}^{-1}$

426. Fundamental frequency of sonometer wire is n. If the length, tension and diameter of wire are tripled, the new fundamental frequency is

a) $\frac{n}{\sqrt{3}}$ b) $\frac{n}{3}$ c) $n\sqrt{3}$ d) $\frac{n}{3\sqrt{3}}$

427. The function $\sin^2(\omega t)$ represents

a) A periodic, but not simple harmonic motion with a period $2\pi/\omega$
b) A periodic, but not simple harmonic motion with a period π/ω
c) A simple harmonic motion with a period $2\pi/\omega$
d) A simple harmonic motion with a period π/ω

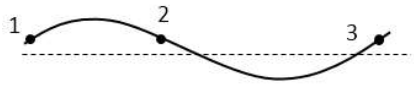
428. Ten tuning fork are arranged in increasing order of frequency in such a way that any two nearest tuning forks produce 4 beats s^{-1}. The highest frequency is twice that of the lowest. Possible highest and lowest frequencies are

a) 80 and 40 b) 100 and 50 c) 44 and 32 d) 72 and 36

429. The equation of a transverse wave travelling along positive x-axis with amplitude 0.2m, velocity 360 ms^{-1} and wavelength 60 m be written as

a) $y = 0.2\sin\pi\left[6\text{t} + \frac{\text{x}}{60}\right]$ b) $y = 0.2\sin\pi\left[6\text{t} - \frac{\text{x}}{60}\right]$
c) $y = 0.2\sin 2\pi\left[6\text{t} - \frac{\text{x}}{60}\right]$ d) $y = 0.2\sin 2\pi\left[6\text{t} + \frac{\text{x}}{60}\right]$

430. The diagram below shows an instantaneous position of a string as a transverse progressive wave travels along it from left to right



Which one of the following correctly shows the direction of the velocity of the points 1, 2 and 3 on the string

1 2 3

a) → → → b) → ← → c) ↓ ↓ ↓ d) ↓ ↑ ↓

431. The beats are produced by two sound sources of same amplitude and of nearly equal frequencies. The maximum intensity of beats will be … that of one source

a) Same b) Double c) Four times d) Eight times

432. The speed of a wave in a medium is 762 m/s. If 3600 waves are passing through a point, in the medium in 2 minutes, then its wavelength is

a) 13.8 m b) 25.3 m c) 41.5 m d) 57.2 m

433. The apparent frequency of a note, when a listener moves towards a stationary source, with velocity of 40 m/s is 200 Hz. When the moves away from the same source with the same speed, the apparent frequency of the same note is 160 Hz. The velocity of sound in air is (in m/s)

a) 360 b) 330 c) 320 d) 340

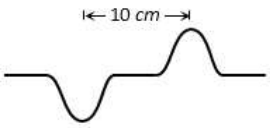
434. Tube A has both ends open while tube B has one end closed. Otherwise they are identical. Their fundamental frequencies are in the ratio

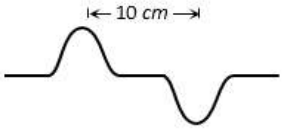
a) 4:1 b) 2:1 c) 1:4 d) 1:4

435. Two monoatomic ideal gases 1 and 2 of molecular masses m_1 and m_2 respectively are enclosed in separate containers kept at the same temperature. The ratio of the speed of sound in gas 1 to that in gas 2 is given by

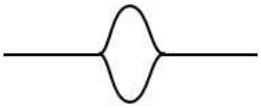
a) $\sqrt{\frac{m_1}{m_2}}$ b) $\sqrt{\frac{m_2}{m_1}}$ c) $\frac{m_1}{m_2}$ d) $\frac{m_2}{m_1}$

436. Two pulses travel in mutually opposite directions in a string with a speed of 2.5 cm/s as shown in the figure. Initially the pulses are $10cm$ apart. What will be the state of the string after two seconds

a) 

b) 

c)

d) 

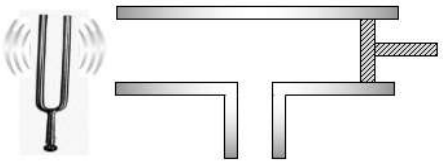
437. In stationary waves all particles between two nodes pass through the mean position
a) At different times with different velocities
b) At different times with the same velocity
c) At the same time with equal velocity
d) At the same time with different velocities

438. Two string A and B are slightly out tune and produces beats of frequency 5Hz. Increasing the tension in B reduces the beat frequency to 3Hz. If the frequency of string A is 450 Hz, calculate the frequency of string B.
a) 460 Hz b) 455 Hz c) 445 Hz d) 440 Hz

439. Two wires are producing fundamental notes of the same frequency. Change in which of the following factors of one wire will not produce beats between them
a) Amplitude of the vibrations b) Material of the wire
c) Stretching force d) Diameter of the wires

440. Two vibrating strings of the same material but length L and 2L have radii 2r and r respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental modes, the one of the length L with frequency v_1 and the other with frequency$v2$. the ratio $v/v_2$is
a) 2 b) 4 c) 8 d) 1

441. Vibrating tuning fork of frequency n is placed near the open end of a long cylindrical tube. The tube has a side opening and is fitted with a movable reflecting piston. As the piston is moved through 8.75 cm, the intensity of sound changes from a maximum to minimum. If the speed of sound is 350 m/s. then n is



a) 500 Hz b) 1000 Hz c) 2000 Hz d) 4000 Hz

442. The phase difference between two points separated by 0.8 m in a wave of frequency is 120 Hz is $\pi/2$. The velocity of wave is
a) 720 m/s b) 384 m/s c) 250 m/s d) 1 m/s

443. An organ pipe, open from both end produces 5 beats per second when vibrated with a source of frequency 200 Hz. The second harmonic of the same pipes produces 10 beats per second with a source of frequency 420 Hz. The frequency of source is
a) 195 Hz b) 205 Hz c) 190 Hz d) 210 Hz

444. Two passenger trains moving with a speed of 108 $km/hour$ cross each other. One of them blows a whistle whose frequency is 750 Hz. If sound speed is 330 m/s, then passengers sitting in the other train, after trains cross each other will hear sound whose frequency will be

a) 900 Hz b) 625 Hz c) 750 Hz d) 800 Hz

445. A train is approaching with velocity $25ms^{-1}$towards a pedestrian standing on the track, frequency of horn of train is 1 kHz. Frequency heard by the pedestrian is $(v = 30ms^{-1})$

a) 1077 Hz b) 1167 Hz c) 985 Hz d) 954 Hz

446. The tension in a wire is decreased by 19%. The percentage decrease in frequency will be

a) 19% b) 10% c) 0.19% d) None of these

447. n waves are produced on a string in one second. When the radius of the string is doubled and the tension is maintained the same, the number of waves produced in one second for the same harmonic will be

a) $\frac{n}{2}$ b) $\frac{n}{3}$ c) $2n$ d) $\frac{n}{\sqrt{2}}$

448. A plane progressive wave is given by y=2cos 6.284 (30t-x).what is period of the wave?

a) $\frac{1}{330}s$ b) $2\pi \times 330s$ c) $(2\pi \times 330)^{-2}s$ d) $\frac{6.284}{330}s$

449. If wave $y = a\cos(\omega t + kx)$ is moving along x-axis, the shape of pulse at t=0 and t=2s

a) Are different b) Are same c) May not be same d) None of these

450. A pipe open at both ends produces a note of frequency f_1. When the pipe is kept with $\frac{3}{4}th$ of its length in water, it produced a note of frequency f_2. The ratio $\frac{f_1}{f_2}$ is

a) $\frac{3}{4}$ b) $\frac{4}{3}$ c) $\frac{1}{2}$ d) 2

451. Equation of a progressive wave is given by

$y = 0.2\cos\pi\left(0.04t + .02x - \frac{\pi}{6}\right)$

The distance is expressed in cm and time in second. What will be the minimum distance between two particles having the phase difference of $\pi/2$

a) 4 cm b) 8 cm c) 25 cm d) 12.5 cm

452. The equation of a wave is given by y=10 sin $\left(\frac{2\pi}{45}t + a\right)$. If the displacement is 5 cm at t=0, then the total phase at t=7.5s is

a) π b) $\frac{\pi}{6}$ c) $\frac{\pi}{2}$ d) $\frac{\pi}{3}$

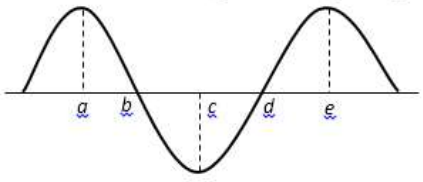
453. Unlike a laboratory sonometer, a stringed instrument is seldom plucked in the middle. Supposing a sitar string is plucked at about $\frac{1}{4}th$ of its length from the end. The most prominent harmonic would be

a) Eighth b) Fourth c) Third d) Second

454. A source of sound of frequency 500 Hz is moving towards an observer with velocity $30ms^{-1}$.The speed of sound is $330ms^{-1}$.The frequency heard by the observer will be

a) 545 Hz b) 580 Hz c) 558.3 Hz d) 550 Hz

455. The rope shown at an instant is carrying a wave travelling towards right, created by a source vibrating at a frequency n. Consider the following statements



I. The speed of the wave is $4n \times ab$

II. The medium at a will be in the same phase as d after $\frac{4}{3n}s$

III. The phase difference between b and e is $\frac{3\pi}{2}$

Which of these statements are correct

a) I, II and III b) II only c) I and III d) III only

456. A source of sound is approaching an observer with speed of 30 ms^{-1} and the observer is approaching the source with a speed 60 ms^{-1}. Then the fractional change in the frequency of sound in air ($330ms^{-1}$) is
a) $\frac{1}{3}$ b) $\frac{3}{10}$ c) $\frac{2}{5}$ d) $\frac{2}{3}$

457. A string of density 7.5 gm cm^{-3} and area of cross-section 0.2mm^2 is stretched under a tension of 20N. when it is plucked at the mid-point, the speed of the transverse wave on the wire is
a) 116ms^{-1} b) 40 ms^{-1} c) 200 ms^{-1} d) 80 ms^{-1}

458. Which of the following has high pitch in their sound
a) Lion b) Mosquito c) Man d) Woman

459. When the temperature of an ideal gas is increased by 600 K, the velocity of sound in the gas becomes $\sqrt{3}$ times the initial velocity in it. The initial temperature of the gas is
a) $-73°C$ b) 27°C c) 127°C d) 327°C

460. If V_m is the velocity of sound in moist air, $V_d$is the velocity of sound in dry air, under identical conditions of pressure and temperature
a) $V_m < V_d$ b) $V_m > V_d$ c) $V_m V_d = 1$ d) $V_m = V_d$

461. A source of sound $S$is moving with a velocity of 50ms^{-1} towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? The velocity of the sound in medium is 350m^{-1}.
a) 750 Hz b) 857 Hz c) 1143 Hz d) 1333 Hz

462. If the ratio of amplitude of two waves is 4 : 3. Then the ratio of maximum and minimum intensity will be
a) 16 : 18 b) 18 : 16 c) 49 : 1 d) 1 : 49

463. A wave is represented by the equation $y = 0.5\sin(10t + x)m$.It is a travelling wave propagating along $+X$ direction with velocity
a) 40ms^{-1} b) 20ms^{-1} c) 5ms^{-1} d) None of these

464. The length of an elastic string is a metre when the longitudinal tension is 4 N and b metre when the longitudinal tension is 5 N. the length of the string in metre when longitudinal tension is 9N, is
a) a-b b) 5b-4a c) $2b - \frac{1}{4}a$ d) 4a-3b

465. Two tuning forks when sounded together produced 4 $beats/sec$. The frequency of one fork is 256. The number of beats heard increases when the fork of frequency 256 is loaded with wax. The frequency of the other fork is
a) 504 b) 520 c) 260 d) 252

466. The nature of sound waves in gases is
a) Transverse b) Longitudinal c) Stationary d) Electromagnetic

467. If the length of a closed organ pipe is 1.5 m and velocity of sound is 330 m/s, then the frequency for the second note is
a) 220 Hz b) 165 Hz c) 110 Hz d) 55 Hz

468. A tuning fork of frequency 250 Hz produces a beat frequency of 10 Hz when sounded with a sonometer vibrating at its fundamental frequency. When the tuning fork is filed, the beat frequency decreases. If the length of the sonometer wire is 0.5 m, the speed of the transverse wave is
a) 260 ms^{-1} b) 250 ms^{-1} c) 240 ms^{-1} d) 500 ms^{-1}

469. In the fundamental mode, time taken by the wave to reach the closed end of the air filled pipe is 0.01s. the fundamental frequency is
a) 25 b) 12.5 c) 20 d) 15

470. A whistle of frequency 500 Hz, tie to the end of a string of length 1.2m, resolves at 400 rev/min. A listener standing some distance away in the plane of rotation of whistle hears frequency in the range of (speed of sound=340 ms^{-1})
a) 436 to 386 Hz b) 426 to 474 Hz c) 426 to 586 Hz d) 436 to 586 Hz

471. If the equation of transverse wave is y=sin (kx-2t), then the maximum particle velocity is

a) 4 unit b) 2 unit c) Zero d) 6 unit

472. A glass tube of length 1.0 m is completely filled with water. A vibrating tuning fork of frequency 500 Hz is kept over the mouth of the tube and water is drained out slowly at the bottom of tube. If velocity of sound in air is 330 ms^{-1}, then the total number of resonance that occur will be
a) 2 b) 3 c) 1 d) 5

473. The minimum audible wavelength at room temperature is about
a) 0.2 Å b) 5 Å c) 5 cm to 2 $metre$ d) 20 mm

474. Two identical sound A and B reach a point in the same phase. The resultant sound is C. The loudness of C is n dB higher the loudness of A.
a) 2 b) 3 c) 4 d) 6

475. If the tension of sonometer's wire increases four times then the fundamental frequency of the wire will increase by
a) 2 times b) 4 times c) 1/2 times d) None of the above

476. A sound source of frequency 170 Hz is placed near a wall. A man walking from a source towards the wall finds that there is a periodic rise and fall of sound intensity. If the speed of sound in air is 340 m/s. then distance (in $metres$) separating the two adjacent position of minimum intensity is
a) 1/2 b) 1 c) 3/2 d) 2

477. Which of the following equation represent a progressive wave?
a) y=A cos ax sin bt b) y=A sin bt c) y=A cos (ax+bt) d) y=A tan (ax+bt)

478. A wave of wavelength $2m$ is reflected from a surface. If a node is formed at $3m$ from the surface, then at what distance from the surface another node will be formed
a) $1m$ b) $2m$ c) $3m$ d) $4m$

479. The wavelength of ultrasonic waves in air is of the order of
a) $5 \times 10^{-1} cm$ b) $5 \times 10^{-3} cm$ c) $5 \times 10^{1} cm$ d) $5 \times 10^{3} cm$

480. The intensity of sound from a radio at a distance of 2 $metres$ from its speaker is $1 \times 10^{-2} \mu W/m^2$. The intensity at a distance of 10 meters would be
a) $0.2 \times 10^{-2} \mu W/m^2$ b) $1 \times 10^{-2} \mu W/m^2$ c) $4 \times 10^{-4} \mu W/m^2$ d) $5 \times 10^{-2} \mu W/m^2$

481. Two similar sonometer wires given fundamental frequencies of $500 Hz$. These have same tensions. By what amount the tension be increased in one wire so that the two wires produce $5 beats/sec$
a) 1% b) 2% c) 3% d) 4%

482. A source of sound placed at the open end of a resonance column sends an acoustic wave of pressure amplitude ρ_0 inside the tube. If the atmospheric pressure is ρ_A, then the ratio of maximum and minimum pressure at the closed end of the tube will be
a) $\frac{(\rho_A + \rho_0)}{(\rho_A - \rho_0)}$ b) $\frac{(\rho_A + 2\rho_0)}{(\rho_A - 2\rho_0)}$ c) $\frac{\rho_A}{\rho_0}$ d) $\frac{\left(\rho_A + \frac{1}{2}\rho_0\right)}{\left(\rho_A - \frac{1}{2}\rho_0\right)}$

483. A source and an observer approach each other with same velocity 50 m/s. If the apparent frequency is $435 sec^{-1}$, then the real frequency is
a) 320 s^{-1} b) $360 sec^{-1}$ c) $390 sec^{-1}$ d) $420 sec^{-1}$

484. A whistle giving out 450 Hz approaches a stationary observer at a speed of 33ms^{-1}. The frequency heard by the observer in Hz is [velocity of sound in air=333ms^{-1}]
a) 409 b) 429 c) 517 d) 500

485. An observer is approaching a stationary source with a velocity 1/4 th of the velocity of sound. Then the ratio of the apparent frequency to actual frequency of source is
a) 4:5 b) 5:4 c) 2:3 d) 3:2

486. In a closed organ pipe, the 1st resonance occurs at 50 cm. At what length of pipe, the 2nd resonance will occur
a) 150 cm b) 50 cm c) 100 cm d) 200 cm

487. Two closed organ pipe A and pipe B have the same length. A is wider than B. they resonate in the fundamental mode at frequencies $v_A and\ v_B$ respectively, then
   a) $v_A = v_B$
   b) $v_A > v_B$
   c) $v_A < v_B$
   d) Either (b) or (c) depending on the ratio of their diameters

488. 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) Plucked at $\frac{l}{4}$ and touch at $\frac{l}{2}$
   b) Plucked at $\frac{l}{4}$ and touch at $\frac{3l}{4}$
   c) Plucked at $\frac{l}{2}$ and touched at $\frac{l}{4}$
   d) Plucked at $\frac{l}{2}$ and touched at $\frac{3l}{4}$

489. Two organ pipes, each closed at one end, give 5 beats s^{-1} when emitting their fundamental notes. If their lengths are in the ratio 50:51, their fundamental frequencies are
   a) 250,255 b) 255,260 c) 260,265 d) 265,270

490. A cylindrical tube, open at both ends, has a fundamental frequency f_0 in air. The tube Is dipped vertically into water such that half of its length is inside water. The fundamental frequency of the air column now is
   a) $3f_0/4$ b) f_0 c) $f_0/2$ d) $2f_0$

491. Two increase the frequency from 100 Hz to 400 Hz the tension in the string has to be changed by
   a) 4 times b) 16 times c) 20 times d) None of these

492. Each of the two strings of length 51.6 cm and 49.1 cm are tensioned separately by 20 N force. Mass per unit length of both the strings is same and equal to 1 g/m. When both the string vibrate simultaneously the number of beats is
   a) 5 b) 7 c) 8 d) 3

493. What should be the velocity of a sound source moving towards a stationary observer so that apparent frequency is double the actual frequency (Velocity of sound is v)
   a) v b) $2v$ c) $\frac{v}{2}$ d) $\frac{v}{4}$

494. The ratio of intensities between two coherent sound sources is 4 : 1. The difference of loudness in decibels (dB) between maximum and minimum intensities, on their interference in space is
   a) 20 log2 b) 10 log2 c) 20 log3 d) 10 log3

495. The displacement y of a particle is given by$y = 4\cos^{-4}\left(\frac{t}{2}\right)\sin(1000t)$. This expression may be considered to be a result of the superposition of how many simple harmonic motions?
   a) 2 b) 3 c) 4 d) 5

496. A string fixed at both ends oscillates in 5 segments, length 10m and velocity of wave is20 ms^{-1}. What is the frequency?
   a) 5 Hz b) 15 Hz c) 10 Hz d) 2 Hz

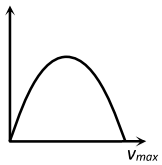
497. A wave is represented by the equation $y = 0.5\sin(10t - x)m$. It is a travelling wave propagating along the $+x$ direction with velocity
   a) 10 m/s b) 20 m/s c) 5 m/s d) None of these

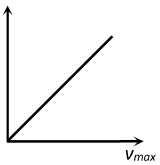
498. A tuning fork of frequency 512 Hz is used to produce vibrations in a sonometer wire of natural frequency 256 Hz. The wire will vibrate in
   a) One segment b) Two segments c) Four segments d) Three segments

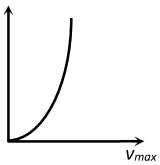
499. A vehicle with a horn of frequency $n$is moving with a velocity of 30ms^{-1} in a direction perpendicular to the straight line joining the observer and the vehicle. The observer perceives the sound to have a frequency $(n + n_1)$.If the sound velocity in air is 300ms^{-1}, then
   a) $n_1 = 10n$ b) $n_1 = 0$ c) $n_1 = 0.1n$ d) $n_1 = -0.1n$

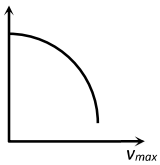
500. A hollow cylinder with both sides open generates a frequency v in air. When the cylinder vertically immersed into water by half its length the frequency will be
   a) V b) 2v c) v/2 d) v/4

501. A sound source emits sound waves in a uniform medium. If energy density is E and maximum speed of the particles of the medium is v_{max}. The plot between E and v_{max} is best represented by

a) 

b) 

c) 

d) 

502. Two sinusoidal waves with same wavelengths and amplitudes travel in opposite directions along a string with a speed 10 ms^{-1}. If the minimum time interval between two instants when the string is flat is 0.5s, the wavelength of the waves is

a) 25 m b) 20 m c) 15 m d) 10 m

503. A plane progressive wave is represented by the equation $y = 0.1 \sin\left(200\pi t - \frac{20\pi x}{17}\right)$ where y is displacement in m, t in second and x is distance from a fixed origin in $meter$. The frequency, wavelength and speed of the wave respectively are

a) 100 Hz, 1.7 m, 170 m/s b) 150 Hz, 2.4 m, 200 m/s

c) 80 Hz, 1.1 m, 90 m/s d) 120 Hz, 1.25 m, 207 m/s

504. Two tuning fork P and Q when set vibrating give 4 beats/s. if a prong of the fork P is filed the beats are reduced to$2s^{-1}$. What is frequency of P, if that of Q is 250 Hz?

a) 246 Hz b) 250 Hz c) 254 Hz d) 252 Hz

505. A tuning fork of known frequency 256 Hz makes 5 beats/s with the vibrating string of a piano. The beat frequency decreases to 2 beats/s when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

a) (256+2)Hz b) (256-2)Hz c) (256-5)Hz d) (256+5)Hz

506. Two waves are represent by

$y_1 = A\sin(kx - \omega t)$

and

$y_2 = A\cos(kx - \omega t)$. The amplitude of resultant wave is

a) 4A b) 2A c) $\sqrt{2}$A d) A

507. Out of following incorrect statement is

a) In meld's experiment p^2T remain constant. (p=loop, T=Tension)

b) In Kundt's experiment distance between two heaps of powder is $\lambda/2$

c) Quink's tube experiment is related with beats.

d) Echo phenomena are related with reflection of sound.

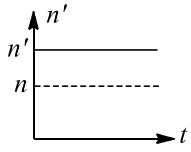
508. If the temperature of the atmosphere is increased, the following character of the sound wave is effected

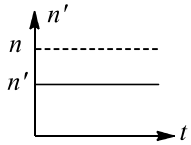
a) Amplitude b) Frequency c) Velocity d) Wavelength

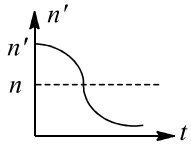
509. An observer standing near the sea shore observes 54 waves per minute. If the wavelength of the water wave is 10m then the velocity of water wave is

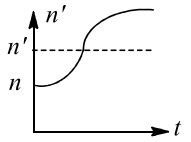
a) 540 ms^{-1} b) 5.4 ms^{-1} c) 0.184 ms^{-1} d) 9 ms^{-1}

510. Source and observer, both start moving simultaneously from origin, one along X-axis and the other along Y-axis with speed of source equal to twice the speed of observer. The graph between the apparent frequency (n') observed by observer and time t in figure would be

a) 

b) 

c) 

d) 

511. Two uniform wires are vibrating simultaneously in their fundamental notes. The tension , lengths diameters and the densities of the two wires are in the ratio 8:1, 36:35, 4:1,and 1:2 respectively. If the note of the higher pitch has a frequency 360 Hz, the number of beats produced per second is

a) 5 b) 15 c) 10 d) 20

512. Fundamental frequency of a sonometer wire is n. if the length and diameter of the wire are doubled keeping the tension same, then the new fundamental frequency is

a) $\frac{2n}{\sqrt{2}}$ b) $\frac{n}{2\sqrt{2}}$ c) $\sqrt{2}n$ d) $\frac{n}{4}$

513. Two sound waves travel in the same direction in a medium. The amplitude of each wave is A and the phase difference between the two waves is120°. The resultant amplitude will

a) $\sqrt{2}A$ b) $2A$ c) $3A$ d) A

514. Doppler effect is independent of

a) Distance between source and listener b) Velocity of source
c) Velocity of listener d) None of the above

515. The number of beats produced per second by two vibrations: $x_1 = x_0 \sin 646\,\pi t$ and $x_2 = x_0 \sin 652\,\pi t$ is

a) 2 b) 3 c) 4 d) 6

516. The ratio of the sound in oxygen to that in hydrogen at same temperature and pressure is approximately

a) 16:1 b) 1:16 c) 4:1 d) 1:4

517. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher at 100 Hz. The fundamental frequency of the open pipe is

a) 200 Hz b) 480 Hz c) 240 Hz d) 300 Hz

518. A stone is hung in air from a wire, which is stretched over a sonometer. The bridges of the sonometer are 40cm apart when the wire is in unison with a tuning fork of frequency 256. When the stone is completely immersed in water, the length between the bridges is 22 cm for re-establishing unison. The specific gravity of material of stone is

a) $\frac{(40^2)}{(40^2)+(22)^2}$ b) $\frac{(40^2)}{(40^2)-(22)^2}$ c) $256 \times \frac{22}{40}$ d) $256 \times \frac{40}{22}$

519. 50 tuning forks are arranged in increasing order of their frequencies such that each gives 4 beats/sec with its previous tuning fork. If the frequency of the last fork is octave of the first, then the frequency of the frequency of the first tuning fork is

a) 200 Hz b) 204 Hz c) 196 Hz d) None of these

520. A particle moving along x-axis has acceleration f, at time t, given by $f = f_0\left(1 - \frac{t}{T}\right)$, where f_0 and T are constants. The particle at $t = 0$ has zero velocity. In the time interval between $t = 0$ has zero velocity. In the time interval between $t = 0$ and the instant when $f = 0$, the particle's velocity (v_x) is

a) f_0T b) $\frac{1}{2}f_0T^2$ c) f_0T^2 d) $\frac{1}{2}f_0T$

521. Under identical conditions of pressure and density, the speed of sound is highest in a

a) Monoatomic gas b) Diatomic gas c) Triatomic gas d) Polyatomic gas

522. Two waves are propagating to the point P along a straight line produced by two sources A and B of simple harmonic and of equal frequency. The amplitude of every wave at P is $'a'$ and the phase of A is ahead by $\pi/3$ than that of B and the distance AP is greater than BP by 50 cm. Then the resultant amplitude at the point P will be, if the wavelength is 1 $meter$

a) $2a$ b) $a\sqrt{3}$ c) $a\sqrt{2}$ d) a

523. The equation of a wave is given as $y = 0.07\sin(12\pi x - 3000\pi t)$where x is in metre and t in second, then the correct statement is

a) $\lambda = \frac{1}{6\text{m}}, \text{v} = 250\text{ms}^{-1}$ b) a=0.07m, $\text{v} = 300\text{ms}^{-1}$

c) N=1500, $\text{v} = 200\ \text{ms}^{-1}$ d) None of the above

524. The Speed of sound in a mixture of 1 mole of helium and 2 moles of oxygen at 27^0C is

a) 800ms^{-1} b) 400.8ms^{-1} c) 600ms^{-1} d) 1200ms^{-1}

525. The equation of a plane progressive waves is given by $y = 0.025\sin(100t + 0.25x)$. The frequency of this wave would be

a) $\frac{50}{\pi}Hz$ b) $\frac{100}{\pi}Hz$ c) $100\ Hz$ d) $50\ Hz$

526. Speed of sound in mercury at a certain temperature is 1450 m/s. Given the density of mercury as $13.6 \times 10^3 kg/m^3$, the bulk modulus for mercury is

a) $2.86 \times 10^{10}N/m^3$ b) $3.86 \times 10^{10}N/m^3$ c) $4.86 \times 10^{10}N/m^3$ d) $5.86 \times 10^{10}N/m^3$

527. Two waves of wavelength 99 cm and 100 cm both travelling with velocity $396ms^{-1}$ are made to interface. The number of beats produced by them per second are

a) 1 b) 2 c) 4 d) 8

528. The displacement of the interfering sound waves are $y_1 = 4\sin\omega t$ and $y_2 = 3\sin\left(\omega t + \frac{\pi}{2}\right)$. What is the amplitude of the resultant wave

a) 5 b) 7 c) 1 d) 0

529. An observer standing at station observes frequency 219 Hz when a train approaches and 184 Hz when train goes away from him. If velocity of sound in air is 340 m/s, then velocity of train and actual frequency of whistle will be

a) $15.5\ ms^{-1}, 200Hz$ b) $19.5\ ms^{-1}, 205Hz$ c) $29.5\ ms^{-1}, 200Hz$ d) $32.5\ ms^{-1}, 205Hz$

530. The equation of a simple harmonic wave is given by $y = 5\sin\ \frac{\pi}{2}(100t - x)$ where x and y are in meter and time is in second. The period of the wave in second will be

a) 0.04 b) 0.01 c) 1 d) 5

531. The equation of a simple harmonic wave is given by$y = 5\sin\frac{\pi}{2}(100t - x)$, where x and y are in metre and time is in second. The period of the wave in second will be

a) 0.04 b) 0.01 c) 1 d) 5

532. Two radio station broadcast their programmes at the same amplitude A and at slightly different frequency ω_1 and ω_2 respectively where$\omega_2 - \omega_1 = 10^3$ Hz. A detector is receiving signals from the two stations simultaneously. It can only detect signals of intensity $>2A^2$. The time interval between successive maxima of the intensity of the signal received by the detector is

a) $10^3 s$ b) $10^{-3}s$ c) $10^{-4}s$ d) $10^4 s$

533. The tones that are separated by three octaves have a frequency ratio of

a) 3 b) 4 c) 8 d) 16

534. In an orchestra, the musical sounds of different instruments are distinguished from one another by which of the following characteristics
a) Pitch b) Loudness c) Quality d) Overtones

535. Two strings with mass per unit length of 9 gcm^{-1} and 25 gcm^{-1} are joined together in series. The reflection coefficient for the vibration waves are
a) $\frac{9}{25}$ b) $\frac{3}{5}$ c) $\frac{1}{16}$ d) $\frac{9}{16}$

536. A source of sound is travelling towards a stationary observer. The frequency of sound heard by the observer is of three times the original frequency. The velocity of sound is $v\ m/sec$. The speed of source will be
a) $\frac{2}{3}v$ b) v c) $\frac{3}{2}v$ d) $3v$

537. Two wires made up of the same material are of equal length but their radii are in the ratio of 1:2. On stretching each of these two strings by the same tension, the ratio between the fundamental frequencies is
a) 1:4 b) 4:1 c) 2:1 d) 1:2

538. The equation of a wave travelling in a string can be written as $y = 3\cos\pi(100t - x)$. Its wavelength is
a) 100 cm b) 2 cm c) 5 cm d) None of the above

539. Of the following, the equation of plane progressive wave is
a) $y = r\sin\omega t$ b) $y = r\sin(\omega t - kx)$ c) $y = \frac{a}{\sqrt{r}}\sin(\omega t - kx)$ d) $y = \frac{a}{r}\sin(\omega t - kx)$

540. If two waves of the same frequency and amplitude respectively on superposition produce a resultant disturbance of the same amplitude, the waves differ in phase by
a) Π b) Zero c) Π/3 d) 2π/3

541. Distance between nodes on a string is 5 cm. velocity of transverse wave is2ms^{-1}. Then the frequency is
a) 5 Hz b) 10 Hz c) 20 Hz d) 15 Hz

542. A wave is represented by the equation y=a cos (kx-ωt) is superposed with another wave to form a stationary wave such that the point x=0 is a node. The equation of the other wave is
a) a sin (kx+ωt) b) - a sin (kx-ωt) c) -a cos (kx+ωt) d) a cos (kx+ωt)

543. Equation of a progressive wave is given by
$y = 4\sin\left\{\pi\left(\frac{t}{5} - \frac{x}{9}\right) + \frac{\pi}{6}\right\}$
Then which of the following is correct
a) $v = 5m/sec$ b) $\lambda = 18m$ c) $a = 0.04\ m$ d) $n = 50\ Hz$

544. *A* is singing a note and at the same time *B* is singing a note with exactly one-eight the frequency of the note of *A*. The energies of two sounds are equal, the amplitude of the note of *B* is
a) Same that of *A* b) Twice as that of *A*
c) Four times as that of *A* d) Eight times as that of *A*

545. When 2 tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats s^{-1} are heard. Now, some tape is attached on the prong of fork 2. When the tuning forks are sounded again, 6 beats s^{-1} are heard if the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2?
a) 196 Hz b) 200 Hz c) 202 Hz d) 204 Hz

546. The velocity of sound in air is 330ms^{-1} and the velocity of light in air is $3 \times 10^8 ms^{-1}$. What frequency, in Hz does a BBC station which transmits at 1500m broadcast?
a) 2×10^5Hz b) 595×10^3Hz c) 0.22 Hz d) 5×10^{-6}Hz

547. Maximum number of beats frequency heard by a human being is
a) 10 b) 4 c) 20 d) 6

548. A vibrating string of certain length I under a tension T resonates with a mode corresponding to the second overtone (third harmonic) of an air column of length 75 cm inside a tube closed at one end. The string also generate 4 beats/s when excited along with a tuning fork of frequency n. now when the tension of the

string also generate 4 beats/s when excited along with a tuning fork of frequency n. now when the tension of the string is slightly increased the number of beats reduces 2 per second. Assuming the velocity of sound in air to be $340ms^{-1}$, the frequency n of the tuning fork in Hz is

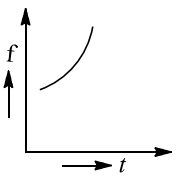
a) 344 b) 336 c) 117.3 d) 109.3

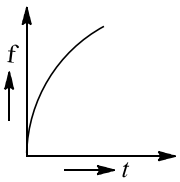
549. Which of the following is the longitudinal wave

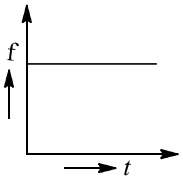
a) Sound waves b) Waves on plucked string

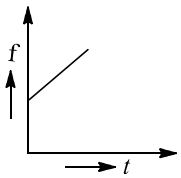
c) Water waves d) Light waves

550. An observer starts moving with uniform acceleration$a$, towards a stationary sound source of frequencyf_0. As the observer approaches the source, the apparent frequency(f)heard by the observer varies with time (t)is

a) 

b) 

c) 

d) 

551. At a certain instant a stationary transverse wave is found to have maximum kinetic energy. The appearance of string at that instant is

a) Sinusoidal shape with amplitude $A/3$ b) Sinusoidal shape with amplitude $A/2$

c) Sinusoidal shape with amplitude A d) Straight line

552. Mechanical waves on the surface of a liquid are

a) Transverse b) Longitudinal

c) Torsional d) Both transverse and longitudinal

553. Transverse waves of same frequency are generated in two steel wires A and B. The diameter of A is twice of B and the tension in A is half that in B. The ratio of velocities of wave in A and B is

a) $1:3\sqrt{2}$ b) $1:2\sqrt{2}$ c) $1:2$ d) $\sqrt{2}:1$

554. Two sounding bodies producing progressive waves are given by $y_1 = 4\sin 400\pi t \; and \; y_2 = 3\sin 404\pi t$ one situated very near to the ear of a person who will hear

a) 2 beats/s with intensity ratio 4/3 between maxima and minima

b) 2 beats/s with intensity ratio 49/1 between maxima and minima

c) 4 beats/s with intensity ratio 4/3 between maxima and minima

d) 4 beats/s with intensity ratio 4/3 between maxima and minima

555. Two identical stringed instruments have frequency 100 Hz. If tension in one of them is increased by 4% and they are sounded together then the number of beats in one second is

a) 1 b) 8 c) 4 d) 2

556. If the tension and diameter of a sonometer wire of fundamental frequency n are doubled and density is halved then its fundamental frequency will become

a) $\frac{n}{4}$ b) $\sqrt{2}n$ c) n d) $\frac{n}{\sqrt{2}}$

557. Three similar wire of frequency n_1, n_2 and n_3 are joined to make one wire. Its frequency will be

a) $n = n_1 + n_2 + n_3$ b) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

c) $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$ d) $\frac{1}{n^1} = \frac{1}{n_1^2} + \frac{1}{n_2^2} + \frac{1}{n_3^2}$

558. The velocity of sound hydrogen is 1224ms^{-1}. Its velocity in mixture of hydrogen and oxygen containing 4 parts by volume of hydrogen and 1 part oxygen is

a) 1224ms^{-1} b) 612ms^{-1} c) 2448ms^{-1} d) 306ms^{-1}

559. If the speed of a wave doubles as it passes from shallow water deeper water, its wavelength will be

a) Unchanged b) Halved c) Doubled d) Quadrupled

560. The amplitude of wave disturbance propagating in positive direction of X–axis is given by $y = \frac{1}{1+x^2}$ at t=0 and by $y = \frac{1}{1+(x-1)^2}$ at t=2s where x and y are in meters. The shape of the wave disturbance does not change during propagation. The velocity of the wave is
a) $0.5 ms^{-1}$ b) $2.0 ms^{-1}$ c) $1.0 ms^{-1}$ d) $4.0 ms^{-1}$

561. A string is stretched between fixed points separated by 75.0 cm. it is observed to have resonant frequency of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. Then, the lowest resonant frequency for this string is
a) 105 Hz b) 1.05 Hz c) 1050 Hz d) 10.5 Hz

562. Two identical flutes produce fundamental notes of frequency 300 Hz at 27°C. If the temperature of air in one flute is increased to 31°C, the number of the beats heard per second will be
a) 1 b) 2 c) 3 d) 4

563. Two wires are fixed in a sonometer. Their tensions are in the ratio 8:1. The lengths are in the ratio 36:35. The diameters are in the ratio 4:1. Densities of the materials are in the ratio 1:2. If the higher frequency in the setting is 360 Hz, the beat frequency when the two wires are sounded together, is
a) 8 b) 5 c) 10 d) 6

564. A man sets his watch by whistle that is 2 km away. How much will his watch be in error. (speed of sound in air 330 m/sec)
a) 3 seconds fast b) 3 seconds slow c) 6 seconds fast d) 6 seconds slow

565. If you set up the ninth harmonic on a string fixed at both ends, its frequency compared to the seventh harmonic
a) Higher b) Lower c) Equal d) None of the above

566. In the musical octave 'Sa', 'Re', 'Ga'
a) The frequency of the note 'Sa' is greater than that of 'Re', 'Ga'
b) The frequency of the note 'Sa' is smaller than that of 'Re', 'Ga'
c) The frequency of all the notes 'Sa', 'Re', 'Ga' is the same
d) The frequency decreases in the sequence 'Sa', 'Re', 'Ga'

567. Sound waves of wavelength greater than that of audible sound are called
a) Seismic waves b) Sonic waves c) Ultrasonic waves d) Infrasonic waves

568. A cylindrical tube open at both the ends has a fundamental frequency of 390 Hz in air. If $\frac{1}{4}$of the tube is immersed vertically in water the fundamental frequency of air column is
a) 260 Hz b) 130 Hz c) 390 Hz d) 520 Hz

569. Two strings with masses per unit length of 25 gcm^{-1} and 9 gcm^{-1} are joined together in series. The reflection coefficient for the vibration waves is
a) $\frac{9}{25}$ b) $\frac{3}{5}$ c) $\frac{1}{16}$ d) $\frac{9}{16}$

570. 16 tuning forks are arranged in the order of increasing frequencies. Any two successive forks give 8 beats per sec when sounded together. If the frequency of the last fork is twice the first, then the frequency of the first fork is
a) 120 b) 160 c) 180 d) 220

571. Two tuning forks have frequencies 380 and 384 hz respectively. When they are sounded together, they produce 4 beats. After hearing the maximum sound, how long will it take to hear the minimum sound
a) 1/2 sec b) 1/4 sec c) 1/8 sec d) 1/16 sec

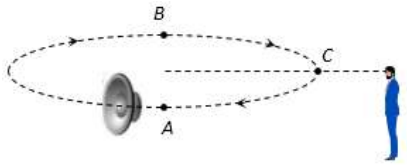
572. What is minimum length of a tube, open at both ends, that resonates with tuning fork of frequency 350 Hz ? [velocity of sound in air = 350 m/s]
a) 50 cm b) 100 cm c) 75 cm d) 25 cm

573. The relation between frequency 'n' wavelength 'λ' and velocity of propagation 'v' of wave is
a) $n = v\lambda$ b) $n = \lambda/v$ c) $n = v/\lambda$ d) $n = 1/v$

574. Two identical wires have the same fundamental frequency of 400 Hz when kept under the same tension. If the tension in one wire is increased by 2% the number of beats produced will be
a) 4 b) 2 c) 8 d) 1

575. Transverse waves can propagate in
a) Liquids b) Solids c) Gases d) None of these

576. A small source of sound moves on a circle as shown in the figure and an observer is standing on O. Let n_1, n_2 and n_3 be the frequencies heard when the source is at A, B and C respectively. Then



a) $n_1 > n_2 > n_3$ b) $n_2 > n_3 > n_1$ c) $n_1 = n_2 > n_3$ d) $n_2 > n_1 > n_3$

577. The loudness and pitch of a sound depends on
a) Intensity and velocity b) Frequency and velocity
c) Intensity and frequency d) Frequency and number of harmonics

578. Two sound waves of wavelengths $5m$ and $6m$ formed 30 beats in 3 seconds. The velocity of sound is
a) 300 ms^{-1} b) 310 ms^{-1} c) 320 ms^{-1} d) 330 ms^{-1}

579. A wave in a string has an amplitude of 2 cm. The wave travels in the +ve direction of x axis with a speed of 128 m/sec and it is noted that 5 complete waves fit in 4 m length of the string. The equation describing the wave is
a) $y = (0.02)m \sin(7.85\, x + 1005t)$ b) $y = (0.02)m \sin(15.7\, x - 2010t)$
c) $y = (0.02)m \sin(15.7\, x + 2010t)$ d) $y = (0.02)m \sin(7.85\, x - 1005t)$

580. The equation of a transverse wave is given by
$y = 10 \sin \pi(0.01x - 2t)$
Where x and y are in cm and t is in second. Its frequency is
a) 10 $\sec^{-1}$ b) 2 $\sec^{-1}$ c) 1 $\sec^{-1}$ d) 0.01 $\sec^{-1}$

581. When a sound wave of frequency 300 Hz passes through a medium, the maximum displacement of a particle of the medium is 0.1 cm. the maximum velocity of the particle is equal to
a) 60 cm/s b) 30 cm/s c) 60 π cm/s d) 30π cm/s

582. In brass, the velocity of longitudinal wave is 100 times the velocity of the transverse wave. If $Y = 1 \times 10^{11}$ NM^{-2}, then stress in the wire is
a) 1×10^{13} Nm^{-2} b) 1×10^{9} Nm^{-2} c) 1×10^{11} Nm^{-2} d) 1×10^{7} Nm^{-2}

583. A bus is moving with a velocity of 5 ms^{-1} towards a huge wall. The driver sounds a horn of frequency 165 Hz. If the speed of sound in air is 335ms^{-1}, the number of beats heard per second by the passengers in the bus will be
a) 3 b) 4 c) 5 d) 6

584. A man sitting in a moving train hears the whistle of the engine. The frequency of the whistle is 600 Hz
a) The apparent frequency as heard by him is smaller than 600 Hz
b) The apparent frequency is larger than 600 Hz
c) The frequency as heard by him is 600 Hz
d) None of the above

585. Water waves are
a) Longitudinal b) Transverse
c) Both longitudinal and transverse d) Neither longitudinal nor transverse

586. Velocity of sound measured in hydrogen and oxygen gas at a given temperature will be in the ratio
a) 1 : 4 b) 4 : 1 c) 2 : 1 d) 1 : 1

587. Calculate the frequency of the second harmonic formed on a string of length 0.5 m and mass $2 \times 10^{-4} kg$ when stretched with a tension of 20 N
a) 274.4 Hz b) 744.2 Hz c) 44.72 Hz d) 447.2 Hz

588. Two waves having sinusoidal waveforms have different wavelengths and different amplitude. They will be having
a) Same pitch and different intensity
b) Same quality and different intensity
c) Different quality and different intensity
d) Same quality and different pitch

589. Wave equations of two particles are given by $y_1 = a\sin(\omega t - kx), y_2 = a\sin(kx + \omega t)$, then
a) They are moving in opposite direction
b) Phase between them is 90°
c) Phase between them is 180°
d) Phase between them is 0°

590. Out of the following, incorrect statement is
a) In Melde's experiment "P^2T" remain constant. (P=Loop, T=Tension)
b) In Kundt's experiment distance between two heaps of powder is $\lambda/2$
c) Quinckeey's tube experiment related with beats
d) Echo phenomena related with reflection of sound

591. Which of the following equations represents a wave travelling along y-axis
a) $y = A\sin(kx - \omega t)$ b) $x = A\sin(ky - \omega t)$ c) $y = A\sin ky\cos\omega t$ d) $y = A\cos ky\sin\omega t$

592. The harmonics which are present in a pipe, open at one end are
a) Odd harmonics
b) Even harmonics
c) Even as well as odd harmonics
d) None of the above

593. An echo repeats two syllables. If the velocity of sound is 330ms^{-1}, then the distance of the reflecting surface is
a) 66.0 m b) 33.0 m c) 99.0 m d) 16.5 m

594. If at same temperature and pressure, the densities for two diatomic gases are respectively d_1 and d_2, then the ratio of velocities of sound in these gases will be
a) $\sqrt{\frac{d_2}{d_1}}$ b) $\sqrt{\frac{d_1}{d_2}}$ c) $d_1 d_2$ d) $\sqrt{d_1 d_2}$

595. A whistle producing sound waves of frequency 9500 Hz above is approaching a stationary person with speedv ms^{-1}. The velocity of sound in air is 300 ms^{-1}. If the person can hear frequency up to a maximum of 10,000 Hz, the maximum value of v up to which he can hear the whistle is
a) $15\sqrt{2}\text{ms}^{-1}$ b) $15/\sqrt{2}\text{ms}^{-1}$ c) $15\ \text{ms}^{-1}$ d) $30\ \text{ms}^{-1}$

596. In the experiment for the determination of the speed of sound in air using the resonance column the resonates in the fundamental mode, with a tuning fork is 0.1m. When this length is changed to 0.35m, the same tuning fork resonates with the first overtone. Calculate the end correction.
a) 0.012 m b) 0.025 m c) 0.05 m d) 0.024 m

597. Velocity of sound waves in air is 330ms^{-1}. For a particular sound in air, a path difference of 40cm is equivalent to a phase difference of 1.6π.The frequency of the wave is
a) 165 Hz b) 150 Hz c) 660 Hz d) 330 Hz

598. A bus is moving with a velocity of $5ms^{-1}$ towards a huge wall. The driver sounds a horn of frequency 165 Hz. If the speed of sound in air is 335 ms^{-1}, the number of beats heard per second by a passenger inside the buss will be
a) 3 b) 4 c) 5 d) 6

599. A motor cycle starts from rest and accelerates along a straight path at 2 ms^{-2}. At the starting point of the motor cycle gone when the driver hears the frequency of the siren at 94% of its value when the motor cycle was rest? (Speed =330 ms^{-1})
a) 49 m b) 98 m c) 147 m d) 196 m

600. Choose the correct statement
a) Beats are due to destructive interference
b) Maximum beat frequency audible to a human being is 20
c) Beats are as a result of Doppler's effect

d) Beats are due to superposition of two waves of nearly equal frequencies

601. The speed of in air is 340 m/s. the speed with which a source of sound should move towards a stationary observer so that the apparent frequency becomes twice of the original is

a) 640 ms^{-1} b) 340 ms^{-1} c) 170 ms^{-1} d) 85 ms^{-1}

602. A wave travels in a medium according to the equation of displacement given by

$y(x,t) = 0.03\sin(2t - 0.01x)$

Where y and x are in *metres* and t in seconds. The wavelength of the wave is

a) 200 m b) 100 m c) 20 m d) 10 m

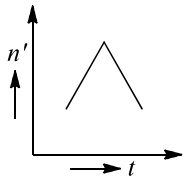
603. Ultrasonic signal sent from SONAR returns to it after reflection from a rock after a lapse of 1 sec. If the velocity of ultrasound in water is 1600 ms^{-1}, the depth of the rock in water is

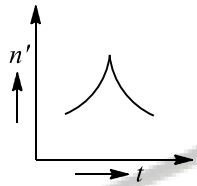
a) 300 m b) 400 m c) 500 m d) 800 m

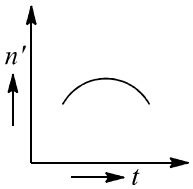
604. A tuning fork gives 4 beats with 50 cm length of a sonometer wire. If the length of the wire is shortened by 1 cm, the number of beats is still the same. The frequency of the fork is

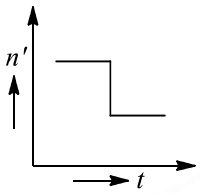
a) 396 b) 400 c) 404 d) 384

605. A railway engine whistling at a constant frequency moves with a constant speed. It goes past a stationary observer standing beside the railway track. The frequency $(n')$of the sound heard by the observer is plotted against time (t), which of the following best represents the resulting curve

a) 

b) 

c) 

d) 

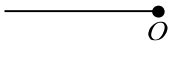
606. An organ pipe P_1 closed at one end vibrating in its first harmonic and another pipe P_2 open at both ends vibrating in its third harmonic are in resonance with a given tuning fork. The ratio of the length of P_1 to that P_2 is

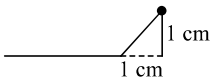
a) 1/3 b) 1/6 c) 3/8 d) 8/3

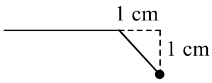
607. The difference between the apparent frequency of a source of sound as perceived by the observer during its approach and recession is 2% of the frequency of the source. If the speed of sound in air is 300 ms^{-1}, the velocity of the source is

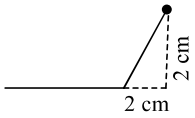
a) 1.5 ms^{-1} b) 12 ms^{-1} c) 6 ms^{-1} d) 3 ms^{-1}

608. In question, the shape of the wave at time$t = 3s$,if O is a fixed end (not free) in is.

a) 

b) 

c) 

d) 

609. When a open pipe I producing third harmonic, number of nodes is

a) 1 b) 2 c) 3 d) 4

610. The relation between time and displacement for two particles is given by

$y_1 = 0.06\sin 2\pi(0.04t + \phi_1), y_2 = 0.03\sin 2\pi(1.04t + \phi_2)$

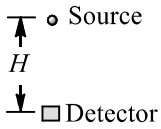
The ratio of the intensity of the waves produced by the vibrations of the two particles will be

a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 4

611. If a source emitting waves a velocity $v/4$ and the observer moves away from the source with a velocity v/6, the apparent frequency as heard by the observer will be (v=velocity of sound)

a) $\frac{14}{15}v$ b) $\frac{14}{9}v$ c) $\frac{10}{9}v$ d) $\frac{2}{3}v$

612. A sound source is falling under gravity. At some time t=0, the detector lies vertically hallow sources at a depth H as shown in figure. If $v$is the velocity of sound and f_0 is frequency recorded after t=2s is



a) f_0 b) $\frac{f_0(v+2g)}{v}$ c) $\frac{f_0(v-2g)}{v}$ d) $f_0\left(\frac{v}{v-2g}\right)$

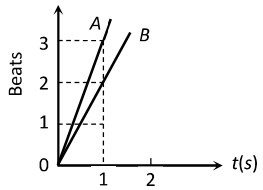
613. A stretched wire of length 110 cm is divided into three segments whose frequencies are in ratio 1 : 2 : 3. Their lengths must be
a) 20 cm ; 30 cm ; 60 cm b) 60 cm ; 30 cm ; 20 cm c) 60 cm ; 20 cm ; 30 cm d) 30 cm ; 60 cm ; 20 cm

614. A steel rod 100 cm long is clamped at its mid-point. The funda-mental frequency of longitudinal vibrations of the rod is given to be 2.53 kHz. What is the speed of sound in steel
a) 5.06 km/s b) 6.06 km/s c) 7.06 km/s d) 8.06 km/s

615. A tuning fork of frequency 500 Cycles/s is sounded on a resonance tube. The first and second resonance is obtained at 17 cm and 52 cm. the velocity of sound in ms^{-1} is
a) 175 b) 350 c) 525 d) 700

616. An organ pipe open at one end is vibrating in first overtone and is in resonance with another pipe open at both ends and vibrating in third harmonic. The ratio of length of two pipe is
a) 1:2 b) 4:1 c) 8:3 d) 3:8

617. Two tuning forks P and Q are vibrated together. The number of beats produced are represented by the straight line OA in the following graph. After loading Q with wax again these are vibrated together and the beats produced are represented by the line OB. If the frequency of P is 341Hz, the frequency of Q will be



a) 341 Hz b) 338 Hz c) 344 Hz d) None of the above

618. A source of sound emits 400πW power which is uniformly distributed over a sphere of 10 m radius. What is the loudness of sound on the surface of a sphere
a) 200 dB b) 200 π dB c) 120 dB d) 120 π dB

619. Doppler phenomena is related with
a) Pitch (frequency) b) Loudness c) Quality d) Reflection

620. If the equation of transverse wave is $y = 5\sin 2\pi\left[\frac{t}{0.04} - \frac{x}{40}\right]$, where distance is in cm and time in second, then the wavelength of the wave is
a) 60 cm b) 40 cm c) 35 cm d) 25 cm

621. Two sound waves of slightly different frequencies propagating in the same direction produce beats due to
a) Interference b) Diffraction c) Polarization d) Refraction

622. The amplitude of a wave is given by $A = \frac{c}{a+b+c}$. Resonance will occur when
a) $b = -\frac{c}{2}$ b) $b = -\frac{a}{2}$ c) $b = 0, a = c$ d) None of these

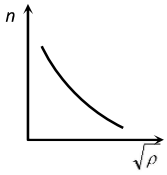
623. The temperature at which the speed of sound in air becomes double of its value at 27°C, is
a) -123°C b) 927°C c) 327°C d) 54°C

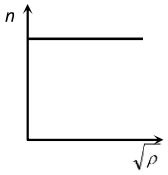
624. If fundamental frequency of closed pipe is 50 Hz then frequency of 2nd overtone is
a) 100 Hz b) 50 Hz c) 250 Hz d) 150 Hz

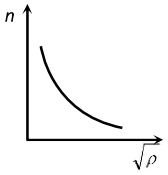
625. A stretched string of length $l$fixed at both ends can sustain stationary waves of wavelength λ given by
a) $\lambda = 2ln$ b) $\lambda = 2l/n$ c) $\lambda = l^2/2n$ d) $\lambda = n^2/2l$

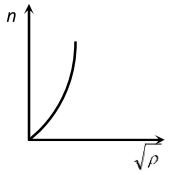
626. A resonance pipe is open at both ends and 30 cm of its length is in resonance with an external frequency 1.1 kHz. If the speed of sound is 330 m/s, which harmonic is in resonance?
a) First b) Second c) Third d) Fourth

627. In stationary waves
   a) Energy is uniformly distributed
   b) Energy is minimum at nodes and maximum at antinodes
   c) Energy is maximum at nodes and minimum at antinodes
   d) Alternating maximum and minimum energy producing at nodes and antinodes
628. A tuning fork of frequency 480 Hz produces 10 beats s^{-1} when sounded with a vibrating sonometer string. What must have been the frequency of string if slight increase in tension produces fewer beats s^{-1} than before?
   a) 490 Hz b) 470 Hz c) 460 Hz d) 480 Hz
629. In a stationary wave represented by y=2a cos kx sin ωt the intensity at a certain point is maximum when
   a) cos kx is maximum b) cos kx is minimum c) Sin ωt is maximum d) sin ωt is minimum
630. A car sounding its horn at 480 Hz moves towards a high wall at a speed of20 ms^{-1}. If the speed of sound is $340ms^{-1}$, the frequency of the reflected sound heard by the girl sitting in the car will be closed to
   a) 540 Hz b) 524 Hz c) 568 Hz d) 480 Hz
631. A light pointer fixed to one prong of a tuning fork touches a vertical plate. The fork is set vibrating and the plate is allowed to fall freely. If eight oscillations are counted when the plate falls through 10 cm, the frequency of the tuning fork is
   a) 360 Hz b) 280 Hz c) 560 Hz d) 56 Hz
632. In two similar wires of tension 16 N and T, 3 beats are heard, then T=
   a) 49 N b) 25 N c) 64 N d) None of these
633. A man, standing between two cliffs, claps his hands and starts hearing a series of echoes at intervals of one second. If the speed of sound in air is 340 ms^{-1}, the distance between the cliffs is
   a) 680 m b) 1700 m c) 340 m d) 1620 m
634. A transverse wave is described by the equation $y = yo \sin 2\ \pi\left(ft\frac{x}{\gamma}\right)$.The maximum particle velocity is equal to four times the wave velocity, if
   a) $\lambda = \frac{\pi y_0}{4}$ b) $\lambda = \frac{\pi y_0}{2}$ c) $\lambda = \pi y_0$ d) $\lambda = 2\pi y_0$
635. The following equations represents progressive transverse waves $Z_1 = A\cos(\omega t - kX)$, $Z_2 = A\cos(\omega t + kX)$, $Z_3 = A\cos(\omega t - kY)$, $Z_4 = A\cos(2\omega t - 2kY)$. A stationary wave will be formed by superposing
   a) $Z_1$and Z_2 b) $Z_1$and Z_4 c) $Z_2$and Z_3 d) $Z_3$and Z_4
636. A set of 24 tuning fork are so arranged that each gives 6 beats/s with the previous one. If the frequency of the last tuning fork is double that of the first, frequency of the second tuning fork is
   a) 138 Hz b) 132 Hz c) 144 Hz d) 272 Hz
637. The number of waves contained in unit length of the medium is called
   a) Elastic wave b) Wave number
   c) Wave pulse d) Electromagnetic wave
638. Two travelling waves $y_1 = A\sin[k(x - ct)]$ and $y_2 = A\sin[k(x + ct)]$ are superimposed on string. The distance between adjacent nodes is
   a) ct/π b) $ct/2\pi$ c) $\pi/2k$ d) π/k
639. Two sound waves with wavelengths 5.0 m and 5.5 m respectively, each propagate in a gas with velocity 330 m/s We expect the following number of beats per second
   a) 1 b) 6 c) 12 d) 0
640. A wave of frequency 500 Hz has a velocity360ms^{-1}. The phase difference between two displacements at a certain point at a time 10^{-3} s apart will be
   a) π rad b) π/2 rad c) π/4 rad d) 2π rad
641. The correct graph between the frequency n and square root of density (ρ) of a wire, keeping its length, radius and tension constant, is

a) 

b) 

c) 

d) 

642. Which of the following is different from others
a) Velocity b) Wavelength c) Frequency d) Amplitude

643. A stationary source is emitted sound at a fixed frequencyf_0, which is reflected by two cars approaching the source. The difference between the is frequencies of sound reflected from the car is 1.2% of f_0. What is the difference in the speed of the cars (in km per hour) to the nearest integer? The cars are moving at constant speeds much smaller than the speed of sound which is $330ms^{-1}$
a) 7.128 km/h b) 7 km/h c) 8.128 km/h d) 9 km/h

644. The distance between two consecutive crests in a wave train produced in a string in 5 cm. If 2 complete waves pass through any point per second, the velocity of the wave is
a) 10 cm/sec b) 2.5 cm/sec c) 5 cm/sec d) 15 cm/sec

645. The ratio of the velocity of sound in hydrogen (γ=7/5) to that helium $\left(\gamma = \frac{5}{3}\right)$ at the same temperature is
a) $\sqrt{\frac{5}{42}}$ b) $\sqrt{\frac{5}{21}}$ c) $\frac{\sqrt{42}}{5}$ d) $\sqrt{\frac{21}{5}}$

646. Tuning fork F_1 has a frequency of 256 Hz and it is observed to produce 6 beats/second with another tuning fork F_2. When F_2 is loaded with wax, it still produces 6 beats/second with F_1. The frequency of F_2 before loading was
a) 253 Hz b) 262 Hz c) 250 Hz d) 259 Hz

647. A rocket is receding away from earth with velocity = 0.2c.The rocket emit signal or frequency 4×10^7 Hz. The apparent frequency of the signal produced by the rocket observed by the observer on earth will be
a) 3×10^6Hz b) 4×10^6Hz c) 2.4×10^7Hz d) 5×10^7Hz

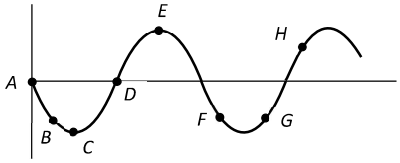
648. Two waves of wavelengths 50 cm and 51 cm produced 12 beats per second. The velocity of sound is
a) 306 m/s b) 331 m/s c) 340 m/s d) 360 m/s

649. n_1 Is the frequency of the pipe closed at one end and n_2 is the frequency of the pipe open at both ends. If both are joined end to end, find the fundamental frequency of closed pipe so formed
a) $\frac{n_1 n_2}{n_2 + 2n_1}$ b) $\frac{n_1 n_2}{2n_2 + n_1}$ c) $\frac{n_1 + 2n_2}{n_2 n_1}$ d) $\frac{2n_1 + n_2}{n_2 n_1}$

650. The equation of a stationary wave along a stretched string is given by $y = 4\sin\frac{2\pi x}{2}\cos 40\pi t$ where $x$and y are in cms and t is in sec. The separation between two adjacent nodes is
a) 3 cm b) 1.5 cm c) 6 cm d) 4 cm

651. In an experiment, it was found that string vibrates in n loops when a mass M is placed o the pan. What mass should be placed on the pa to make it vibrate in $2n$ loops, with same frequency. Neglect the mass of the pan.
a) $M/4$ b) $4M$ c) $2M$ d) $M/2$

652. The diagram below shows the propagation of a wave. Which points are in same phase



a) F, G b) C and E c) B and G d) B and F

653. A sonometer wire 100 cm long has a fundamental frequency of 330 Hz. The velocity of propagation of transverse waves on the wire is
a) 330 ms^{-1} b) 660 ms^{-1} c) 990 ms^{-1} d) 115 ms^{-1}

654. A heavy uniform rope changes vertically from the ceiling, with its lower end free. A disturbance on the rope travelling upwards from the lower end has a velocity v at a distance x from the lower end such that
a) $v \propto x$ b) $v \propto \sqrt{x}$ c) $v \propto \frac{1}{x}$ d) $v \propto \frac{1}{\sqrt{x}}$

655. Two wires of the same material and radii r and $2r$ respectively are velded together end to end. The combination is used as a sonometer wire and kept under tension$T$. The welded point is midway between the two bridges. When stationary waves are set up in the composite wire, the joint is a node. Then the ratio of the number of loops formed in the thinner to thicker wire is
a) 2:3 b) 1:2 c) 2:1 d) 5:4

656. Sound velocity is maximum in
a) H_2 b) N_2 c) He d) O_2

657. The intensity of sound wave while passing through an elastic medium falls down by 10% as it covers one metre distance through the medium. If the initial intensity of the sound wave was 100 $decibels$, its value after it has passed through 3 $metre$ thickness of the medium will be
a) 70 $decibel$ b) 72.9 $decibel$ c) 81 $decibel$ d) 60 $decibel$

658. A string on a musical instrument is 50 cm long and its fundamental frequency is 270 Hz. If the desired frequency of 1000 Hz is to be produced, the required length of the string is
a) 13.5 cm b) 2.7 cm c) 5.4 cm d) 10.3 cm

659. The speed of sound in a gas
a) Does not depend upon density of the gas
b) Does not depend upon charges in pressure
c) Does not depend upon temperature
d) Depends upon density of the gas

660. In the experiment to determine the speed of sound using a resonance column
a) Prongs of the tuning fork are kept in a vertical plane
b) Prongs of the tuning fork are kept in a horizontal plane
c) In one of the two resonance observed, the length of the resonating air column is close to the wavelength of sound in air
d) In one of the two resonance observed, the length of the resonating air column is close to half of the wavelength of sound in air

661. A travelling wave represented by $y = a\sin(\omega t - kx)$ is superimposed on another wave represented by $y = a\sin(\omega t + kx)$. The resultant is
a) A standing wave having nodes at $x = \left(n + \frac{1}{2}\right)\frac{\lambda}{2}, n = 0,1,2$
b) A wave travelling along + x direction
c) A wave travelling along - x direction
d) A standing wave having nodes at $x = \frac{n\lambda}{2}; n = 0,1,2$

662. Two waves are approaching each other with a velocity of 20 m/s and frequency n. The distance between two consecutive nodes is
a) $\frac{20}{n}$ b) $\frac{10}{n}$ c) $\frac{5}{n}$ d) $\frac{n}{10}$

663. Frequency range of the audible sounds is
a) 0 $Hz - 30$ Hz b) 20 $Hz - 20$ kHz c) 20 $kHz - 20{,}000$ kHz d) 20 $kHz - 20$ MHz

664. The relation between phase difference ($\Delta\phi$) and path difference (Δx) is
a) $\Delta\phi = \frac{2\pi}{\lambda}\Delta x$ b) $\Delta\phi = 2\pi\lambda\Delta x$ c) $\Delta\phi = \frac{2\pi\lambda}{\Delta x}$ d) $\Delta\phi = \frac{2\Delta x}{\lambda}$

665. If you set up the seven overtone on a string fixed at both ends, how many nodes and antinodes are set up in it?
a) 6,5 b) 5,4 c) 4,3 d) 3,2

666. The distance between the nearest node and antinode in a stationary wave is
a) λ b) $\lambda/2$ c) $\lambda/4$ d) 2λ

667. In stationary waves, antinodes are the points where there is
a) Minimum displacement and minimum pressure change
b) Minimum displacement and maximum pressure change
c) Maximum displacement and maximum pressure change
d) Maximum displacement and minimum pressure change

668. An open pipe resonates with a tuning fork of frequency 500 Hz. It is observed that two successive nodes are formed at distance 16 and 46 cm from the open end. The speed of sound in air in the pipe is
a) 260 ms^{-1} b) 300 ms^{-1} c) 320 ms^{-1} d) 360 ms^{-1}

669. Doppler effect is applicable for
a) Moving bodies b) One is moving and other are stationary
c) For relative motion d) None of these

670. A motor car is approaching towards a crossing with a velocity of 72 kmh^{-1}. The frequency of sound of its horn as heard by a policeman standing on the crossing is 260Hz. The frequency of horn is
a) 200 Hz b) 244 Hz c) 150 Hz d) 80 Hz

671. A closed Prgan pipe and an open organ pipe of same length produce 2 beats/second while vibrating in their fundamental modes. The length of the open organ pipe is halved and that of closed pipe is doubled. Then the number of beats produced per second while vibrating in the fundamental mode is
a) 2 b) 6 c) 8 d) 7

672. Find the frequency of minimum distance between compression & rarefaction of a wire. If the length of the wire is 1 m & velocity of sound in air is 360 m/s
a) 90 sec^{-1} b) 180 sec^{-1} c) 120 sec^{-1} d) 360 sec^{-1}

673. A transverse wave is represented by $y = A\sin(wt - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity
a) A b) $\pi A/2$ c) πA d) $2\pi A$

674. The intensity of sound increases at night due to
a) Increase in density of air b) Decreases in density of air
c) Low temperature d) None of these

675. 25 tuning forks arranged in series in the order of decreasing frequency. Any two successive forks produce 3 beats/sec. If the frequency of the first tuning fork is the octave of the last fork, then the frequency of the 21st fork is
a) 72 Hz b) 288 Hz c) 84 Hz d) 87 Hz

676. The length of a sonometer wire AB is 110 cm. Where should the two bridges be placed from A to divide the wire in three segments whose fundamental frequencies are in the ratio of 1:2:3
a) 30 cm, 90 cm b) 60 cm, 90 cm c) 40 cm, 70 cm d) None of these

677. The phase difference between two waves represented by
$y_1 = 10^{-6}\sin[100t + (x/50) + 0.5]m$
$y_2 = 10^{-6}\cos[100t + (x/50)]m$
Where x is expressed in metres and t is expressed in second, is approximately
a) 1.5 rad b) 1.07 rad c) 2.07 rad d) 0.5 rad

678. Stationary waves are set up in air column. Velocity of sound in air is 330 m/s and frequency is 165 Hz. Then distance between the nodes is
a) 2 m b) 1 m c) 0.5 m d) 4 m

679. A wave is represented by the equation $y = 7\sin\{\pi(2t - 2x)\}$ where x is in $metres$ and t in seconds. The velocity of the wave is
a) 1 m/s b) 2 m/s c) 5 m/s d) 10 m/s

680. A car sounding a horn of frequency 1000 Hz passes an observer. The ratio of frequencies of the horn noted by the observer before and after passing of the car is 11 : 9. If the speed of sound is v, the speed of the car is

a) $\frac{1}{10}v$ b) $\frac{1}{2}v$ c) $\frac{1}{5}v$ d) v

681. The wavelength of infrasonics in air is of the order of

a) 10^0m b) 10^1m c) 10^{-1}m d) 10^{-2}m

682. The length of a sonometer wire tuned to a frequency of 250 Hz is 0.60 $metre$. The frequency of tuning fork with which the vibrating wire will be in tune when the length is made 0.40 $metre$ is

a) 250 Hz b) 375 Hz c) 256 Hz d) 384 Hz

683. A string vibrates according to the equation $y = 5\sin\left(\frac{2\pi x}{3}\right)\cos 20\pi t$ where x and y are in cm and t in second. The distance between two adjacent nodes is

a) 3 cm b) 4.5 cm c) 6 cm d) 1.5 cm

684. An open tube is in resonance with string. If tube is dipped in water, so that 75% of length of tube is inside water, then ratio of the frequency (v_0) of tube to string is

a) v_0 b) $2v_0$ c) $\frac{2}{3}v_0$ d) $\frac{3}{2}v_0$

685. It is possible to hear beats from the two vibrating sources of frequency

a) 100 Hz and 150 Hz b) 20 Hz and 25 Hz
c) 400 Hz and 500 Hz d) 1000 Hz and 1500 Hz

686. A sound absorber attenuates the sound level by 20 dB. The intensity decreases by a factor of

a) 100 b) 1000 c) 10000 d) 10

687. A source of sound of frequency n is moving towards a stationary observer with a speed S. If the speed of sound in air is V and the frequency heard by the observer is n_1, the value of n_1/n is

a) $(V+S)/V$ b) $V/(V+S)$ c) $(V-S)/V$ d) $V/(V-S)$

688. A source and an observer move away from each other with a velocity of 10 m/s with respect to ground. If the observer finds the frequency of sound coming from the source as 1950 Hz, then actual frequency of the source is (velocity of sound in air = 340 m/s)

a) 1950 Hz b) 2068 Hz c) 2132 Hz d) 2486 Hz

689. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth. The speed of S waves is about 4.5 km/s and that of P waves is about 8.0km/s. A seismograph records P and S waves from an earthquake. The first P wave arrives 4.0 min before the first S wave. The epicenter of the earthquake is located at a distance about

a) 25 km b) 250 km c) 2500 km d) 5000 km

690. A source of sound emitting a tone of frequency 200 Hz moves towards an observer with a velocity v equal to the velocity of sound. If the observer also moves away from the source with the same velocity v, the apparent frequency heard by the observer is

a) 50Hz b) 100 Hz c) 150 Hz d) 200 Hz

691. A sound wave of frequency n travels horizontally to the right. It is reflected from a large vertical plane surface moving to the left with speed v. The speed of the sound in the medium is c. Then

a) The frequency of the reflected wave is $n\left[\frac{c+v}{c-v}\right]$

b) The wavelength of the reflected wave is $\left[\frac{c}{n}\right]\left[\frac{c+v}{c-v}\right]$

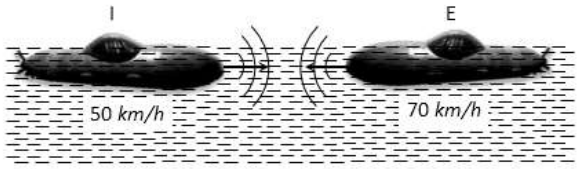
c) The number of waves strike the surface per second is $n\left[\frac{c+v}{c}\right]$

d) The number of beats heard by a stationary listener to the left to the reflecting surface is $\left[\frac{nv}{c-v}\right]$

692. The wavelengths of two waves are 50 and 51 cm respectively. If the temperature of the room is 20°C, then what will be the number of beats produced per second by these waves, when the speed of sound at 0°C is 332 m/sec

a) 14 b) 10 c) 24 d) None of these

693. An Indian submarine and an enemy submarine move towards each other during maneuvers in motionless water in the Indian ocean. The Indian submarine moves at 50 km/h, and the enemy submarine at 70 km/h. The Indian sub sends out a sonar signal (sound wave in water) at 1000 Hz. Sonar waves travel at 5500 km/h. What is the frequency detected by the Indian submarine



a) 1.04 kHz b) 2 kHz c) 2.5 kHz d) 4.7 kHz

694. Two adjacent piano keys are struck simultaneously. The notes emitted by them have frequencies n_1 and n_2. The number of beats heard per second is

a) $\frac{1}{2}(n_1 - n_2)$ b) $\frac{1}{2}(n_1 + n_2)$ c) $n_1 \sim n_2$ d) $2(n_1 - n_2)$

695. The speed of sound oxygen (O_2) at a certain temperature is 460 ms^{-1}. The speed of sound in helium (He) at the same temperature will be (assume both gases to be ideal)

a) 500 ms^{-1} b) 650 ms^{-1} c) 330 ms^{-1} d) 1420 ms^{-1}

696. Find beat frequency? Motion of two particles is given by

$y_1 = 0.25\sin(310t)$

$y_2 = 0.25\sin(316t)$

a) 3 b) $\frac{3}{\pi}$ c) $\frac{6}{\pi}$ d) 6

697. When two sound waves with a phase difference of $\pi/2$, and each having amplitude A and frequency ω, are superimposed on each other, then the maximum amplitude and frequency of resultant wave is

a) $\frac{A}{\sqrt{2}}:\frac{\omega}{2}$ b) $\frac{A}{\sqrt{2}}:\omega$ c) $\sqrt{2}A:\frac{\omega}{2}$ d) $\sqrt{2}A:\omega$

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

a) $\pi/4$ b) $\pi/2$ c) π d) 2π

699. An open pipe of length 33 cm resonates with frequency of 100 Hz. If the speed of sound is 330 m/s, then this frequency is

a) Fundamental frequency of the pipe b) Third harmonic of the pipe

c) Second harmonic of the pipe d) Fourth harmonic of the pipe

700. Two tuning forks have frequencies 450 Hz and 454 Hz respectively. On sounding these forks together, the time interval between successive maximum intensities will be

a) 1/4 sec b) 1/2 sec c) 1 sec d) 2 sec

701. Energy is not carried by which of the following waves

a) Stationary b) Progressive c) Transverse d) Electromagnetic

702. The fundamental frequencies of an open and a closed tube, each of same length L with v as the speed of sound in air, respectively are

a) $\frac{v}{2L}$ and $\frac{v}{L}$ b) $\frac{v}{L}$ and $\frac{v}{2L}$ c) $\frac{v}{2L}$ and $\frac{v}{4L}$ d) $\frac{v}{4L}$ and $\frac{v}{2L}$

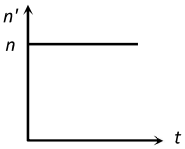
703. Two instruments having stretched strings are being played in union. When the tension of one of the instruments is increased by 1%, 3 beats are produced in 2s. the initial frequency of vibration of each wire is

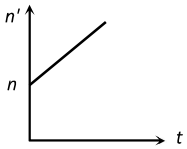
a) 300 Hz b) 500 Hz c) 1000 Hz d) 400 Hz

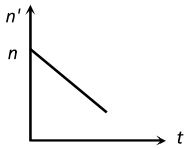
704. The displacement y of a wave travelling in the x -direction is given by $y = 10^{-4}\sin(600t - 2x + \frac{\pi}{3})$ meters, where x is expressed in meters and t is second. The speed of the wave-motion, in ms^{-1}, is

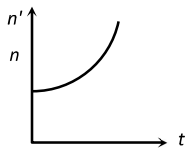
a) 200 b) 300 c) 600 d) 1200

705. An observer starts moving with uniform acceleration a toward a stationary sound source emitting a whistle of frequency n. As the observer approaches source, the apparent frequency, heard by the observer varies with time as

a) 

b) 

c) 

d) 

706. A tuning fork of frequency 330 Hz resonates with an air column of length 120 cm in a cylindrical tube, in the fundamental mode. When water is slowly poured in it, the minimum height of water required for observing resonance once again is (velocity of sound $330ms^{-1}$)

a) 75 cm b) 60 cm c) 50 cm d) 45 cm

707. A man stands in front of a hillock and fires a gun. He hears an echo after 1.5 sec. The distance of the hillock from the man is (velocity of sound in air is 330 m/s)

a) 220 m b) 247.5 m c) 268.5 m d) 292.5 m

708. A whistle sends out 256 waves in a second. If the whistle approaches the observer with velocity 1/3 of the velocity of sound in air, the number of waves per second the observer will receive

a) 384 b) 192 c) 300 d) 200

709. A motor car blowing a horn of frequency $124vib/sec$ moves with a velocity 72 km/hr towards a tall wall. The frequency of the reflected sound heard by the driver will be (velocity of sound in air is 330 m/s)

a) 109 vib/sec b) 132 vib/sec c) 140 vib/sec d) 248 vib/sec

710. A sound source is moving towards stationary listener with $\frac{1}{10}$th of the speed of sound. The ratio of apparent to real frequency is

a) $\left(\frac{9}{10}\right)^2$ b) 10/9 c) 11/10 d) $\left(\frac{11}{10}\right)^2$

711. With what velocity should an observer approach stationary sound source, so that apparent frequency of sound should appear double the actual frequency? (v is velocity of sound)

a) $\frac{v}{2}$ b) 3v c) 2v d) V

712. Ultrasonic waves are produced by

a) Piezoelectric effect b) Pettiro's effect c) Doppler's effect d) Coulomb's law

713. The frequency of transverse vibrations in a stretched string is 200 Hz. If the tension is increased four times and the length is reduced to one-fourth the original value, the frequency of vibration will be

a) 25 Hz b) 200 Hz c) 400 Hz d) 1600 Hz

714. When a guitar string is sounded with a 440 Hz tuning fork, a beat frequency of 5 Hz is heard. If the experiment is repeated with a tuning fork of 437 Hz, the beat frequency is 8 Hz. The string frequency (Hz) is

a) 445 b) 435 c) 429 d) 448

715. A man standing on a cliff claps his hand hears its echo after 1 sec. If sound is reflected from another mountain and velocity of sound in air is 340 m/sec. Then the distance between the man and reflection point is

a) 680 m b) 340 m c) 85 m d) 170 m

716. The period of a wave is 360 ms^{-1} and frequency is 500 Hz. Phase difference between two consecutive particals is 60, then path different between them will be

a) 0.72 cm b) 120 cm c) 12 cm d) 7.2 cm

717. The temperature at which the speed of sound in air becomes double of its value at 0°C is

a) 273 K b) 546 K c) 1092 K d) 0 K

718. The displacement y(in cm) produced by a simple harmonic waves is $y = \frac{10}{\pi}\sin\left(2000\pi t - \frac{\pi x}{17}\right)$. The periodic time and maximum velocity of the particles in the medium will respectively be

a) $10^{-3} sec$ and 330 m/sec b) $10^{-4} sec$ and 20 m/sec
c) $10^{-3} sec$ and 200 m/sec d) $10^{-2} sec$ and 2000 m/sec

719. At which temperature the speed of sound in hydrogen will be same as that of speed of sound in oxygen at 100°C
a) -148°C b) -212.5°C c) -317.5°C d) -249.7°C

720. Standing stationary waves can be obtained in an air column even if the interfering waves are
a) Of different pitches b) Of different amplitudes
c) Of different qualities d) Moving with different velocities

721. 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 is open and another end is closed d) None of the above

722. The wave length of light in visible part (λ_V) and for sound (λ_S) are related as
a) $\lambda_V > \lambda_S$ b) $\lambda_S > \lambda_V$ c) $\lambda_S = \lambda_V$ d) None of these

723. **Statement I** Two longitudinal waves given by equation $y_1(x,t) = 2a\sin(\omega t - kx)$ and $y_2(x,t) = a\sin(2\omega t - 2kx)$ will have equal intensity.
Statement II Intensity of waves of given frequency in same medium is proportional to square of amplitude only
a) Statement I is false, Statement II is true b) Statement I is true, Statement II is false
c) Statement I is true, Statement II is true, Statement II is the correct explanation of statement I d) Statement I is true, Statement II is true, Statement II is not correct explanation of statement I

724. The equation of a progressive wave is $y = 8\sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$. The wavelength of the wave is
a) 8 m b) 4 m c) 2 m d) 10 m

725. In order to double the frequency of the fundamental note emitted by a stretched string, the length is reduced to $3/4th$ 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

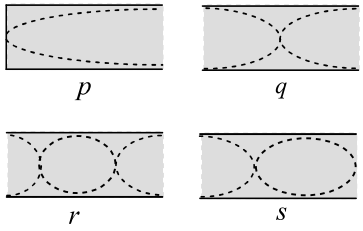
726. An engine moving towards a wall with a velocity 50 ms^{-1} emits a note of 1.2 kHz. Speed of sound in air is 350 ms^{-1}. The frequency of the note after reflection from the wall as heard by the driver of the engine is
a) 2. 4kHz b) 0.24 kHz c) 1.6 kHz d) 1.2 kHz

727. The type of waves that can be propagated through solid is
a) Transverse b) Longitudinal c) Both (a) and (b) d) None of these

728. With what velocity an observer should move relative to a stationary source so that he hears a sound of double the frequency of source
a) Velocity of sound towards the source
b) Velocity of sound away from the source
c) Half the velocity of sound towards the source
d) Double the velocity of sound towards the source

729. Standing waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and the wave velocity is 20 m/s, the frequency is
a) 2 Hz b) 4 Hz c) 5 Hz d) 10 Hz

730. The vibrating of four air columns are represented in the figure. The ratio of frequencies $n_p : n_q : n_r : n_s$ is



a) 12:6:3:5 b) 1:2:4:3 c) 4:2:3:1 d) 6:2:3:4

731. Two trains, one coming towards and another going away from an observer both at 4 m/s produce whistle simultaneously of frequency 300 Hz. Find the number of beats produced
a) 5 b) 6 c) 7 d) 12

732. Equation of progressive wave is
$y = a\sin\left[10\pi x + 11\pi t + \frac{\pi}{3}\right]$
a) Its wavelength is 0.2 units
b) It is travelling in the positive x-direction
c) Wave velocity is 1.5 unit
d) Time period of SHM is 1 s

733. A vehicle sounding a whistle of frequency 256 Hz is moving on a straight road, towards a hill with a velocity of10 ms^{-1}. The number of beats per second observed by a person travelling in the vehicle is (velocity of sound =330 ms^{-1})
a) Zero b) 10 c) 14 d) 16

734. Two strings A and B of lengths, $L_A = 80\ cm$ and $L_B = x\ cm$respectively are used separately in a sonometer. The ratio of their densities (d_A/d_B) 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

735. The apparent wavelength of the light from a star moving away from the earth is 0.2% more than its actual wavelength. Then the velocity of the star is
a) $6 \times 10^7 \text{ms}^{-1}$ b) $6 \times 10^6 \text{ms}^{-1}$ c) $6 \times 10^5 \text{ms}^{-1}$ d) $6 \times 10^4 \text{ms}^{-1}$

736. Compressional wave pulse are sent to the bottom of sea from a ship and the echo is heard after 2s. if bulk modulus of elasticity of water is $2 \times 10^9 Nm^{-2}$and mean temperature is 4°C, the depth of the sea will be
a) 1014 m b) 1414 m c) 2828 m d) None of these

737. The length of two open organ pipes are l and $(l + \Delta l)$ respectively. Neglecting end correction, the frequency of beats between them will be approximately
a) $\frac{v}{2l}$ b) $\frac{v}{4l}$ c) $\frac{v\Delta l}{2l^2}$ d) $\frac{v\Delta l}{l}$

738. 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 it is in water. The fundamental frequency of air column is now
a) $f/2$ b) f c) $3f/4$ d) $2f$

739. When a longitudinal wave propagates through a medium, the particles of the medium execute simple harmonic oscillations about their mean positions. These oscillations of a particle are characterised by an invariant
a) Kinetic energy
b) Potential energy
c) Sum of kinetic energy and potential energy
d) Difference between kinetic energy and potential energy

740. The two interfering waves have intensities in the ratio 9 : 4. The ratio of intensities of maxima and minima in the interference pattern will be
a) 1 : 25 b) 25 : 1 c) 9 : 4 d) 4 : 9

741. The wave equation is $y = 030\sin(314t - 1.57x)$ where t, x and y are in second, meter and centimeter respectively. The speed of the wave is
a) 100 m/s b) 200 m/s c) 300 m/s d) 400 m/s

742. A string fixed at both the ends is vibrating in two segments. The wavelength of the corresponding wave is
a) $\frac{l}{4}$ b) $\frac{l}{2}$ c) l d) $2l$

743. Two waves are represented by $y_1 = a\sin\left(\omega t + \frac{\pi}{6}\right)$ and $y_2 = a\cos\omega t$. What will be their resultant amplitude
a) a b) $\sqrt{2}a$ c) $\sqrt{3}a$ d) $2a$

744. The frequency of a sound wave is n and its velocity is v. If the frequency is increased to $4n$, the velocity of the wave will be

a) v b) $2v$ c) $4v$ d) $v/4$

745. In meld's experiment in the transverse mode, the frequency of the tuning fork and the frequency of the waves in the string are in the ratio
a) 2:1 b) 4:1 c) 1:1 d) 1:2

746. Source of sound and the observer are mutually at rest. If speed of sound is changed, then the frequency of sound heard by the observer will appear to be
a) Increased b) Decreased
c) Unchanged d) Decreasing exponentially

747. Two sound waves are represented by $y = a\sin(\omega t - kx)$ and$y = a\cos(\omega t - kx)$. The wavelength of wave I water are
a) $\pi/2$ b) $\pi/4$ c) π d) $3\pi/4$

748. In a resonance tube, using a tuning fork of frequency 325 Hz, two successive resonance lengths are observed as 25.4 cm and 77.4 cm respectively. The velocity of sound in air is
a) 338 ms^{-1} b) 328 ms^{-1} c) 330 ms^{-1} d) 320 ms^{-1}

749. Two waves having equations
$x_1 = a\sin(\omega t + \phi_1),\ x_2 = a\sin(\omega t + \phi_2)$
If in the resultant wave the frequency and amplitude remain equal to those of superimposing waves. Then phase difference between them is
a) $\pi/6$ b) $2\pi/3$ c) $\pi/4$ d) $\pi/3$

750. In open organ pipe, if fundamental frequency is n then the other frequencies are
a) $n, 2n, 3n, 4n$ b) $n, 3n, 5n$ c) $n, 2n, 4n, 8n$ d) None of these

751. The speed of sound in air is 340 m/s. The speed with which a source of sound should move towards a stationary observer so that the apparent frequency becomes twice of the original
a) $640m/s$ b) $340m/s$ c) $170m/s$ d) $85m/s$

752. A simple harmonic progressive wave is represented by the equation
$Y = 8\sin 2\pi(0.1x - 2t)$ where x and y are in cm and t is in seconds. At any instant, the phase difference between two particles separated by 2.0 cm in the x-direction is
a) 18^0 b) 54^0 c) 36^0 d) 72^0

753. $y = 3\sin\pi\left(\frac{1}{2} - \frac{x}{4}\right)$ Represents an equation of a progressive wave, where t is in second an x is in metre. The distance travelled by the wave in 5 s is
a) 8m b) 10m c) 5m d) 32m

754. Two forks A and B when sounded together produce four beats s^{-1}. 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. The frequencies of the forks are
a) 24 Hz, 28 Hz b) 20 Hz, 24 Hz c) 16 Hz, 20 Hz d) 26 Hz, 30 Hz

755. A string of length 0.4m and mass 10^{-2} kg is tightly clamped at the ends. The tension in the string is 1.6 N. Identical wave pulses are produced at one end at equal intervals of timeΔt. The minimum value of Δt, which allows constructive interference between successive pulses is
a) 0.05 s b) 0.10 s c) 0.20 s d) 0.40 s

756. In a plane progressive wave given by $y = 25\cos(2\pi t - \pi x)$, the amplitude and frequency are respectively
a) 25,100 b) 25,1 c) 25,2 d) $50\pi, 2$

757. A wave equation which gives the displacement along y-direction is given by $y = 0.001\sin(100t + x)$ where x and y are in meter and t is time in second. This represented a wave
a) Of frequency $100/\pi\ Hz$
b) Of wavelength one metre
c) Travelling with a velocity of $50/\pi\ ms^{-1}$ in the positive X-direction
d) Travelling with a velocity of 100 ms^{-1} in the negative X-direction

758. An organ pipe open at one end is vibrating in first overtone and is in resonance with another pipe open at both ends and vibrating in third harmonic. The ratio of length of two pipe is

a) 3:8 b) 8:3 c) 1:2 d) 4:1

759. Suppose that the speed of sound in air at a given temperature is 400 m/sec. An engine blows a whistle at 1200 Hz frequency. It is approaching an observer at the speed of 100 m/sec. What is the apparent frequency as heard by the observer

a) 600 Hz b) 1200 Hz c) 1500 Hz d) 1600 Hz

760. A string vibrates with a frequency of 200 Hz. When its length is doubled and tension is altered, it begins to vibrate with a frequency of 300 Hz. The ratio of the new tension to the original tension is

a) 9:1 b) 1:9 c) 3:1 d) 1:3

761. The equation $y = a\sin 2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)$, where the symbols carry the usual meaning and a, T and λ ate positive, represents a wave of

a) Amplitude 2a b) Period T/λ

c) Speed xλ d) Speed (λ/T)

762. A siren emitting sound of frequency 800 Hz is going away from a static listener with a speed of 30 m/s, frequency of the sound to be heard by the listener is (take velocity of sound as 330 m/s)

a) 733.3 Hz b) 644.8 Hz c) 481.2 Hz d) 286.5 Hz

763. An empty vessel is partially filled with water, then the frequency of vibration of air column in the vessel

a) Remains same b) Decreases

c) Increases d) First increases then decreases

764. In a resonance pipe the first and second resonance are obtained at depths 22.7 cm and 70.2 cm respectively. What will be the end correction?

a) 1.05 cm b) 115.5 cm c) 92.5 cm d) 113.5 cm

765. A transverse progressive wave on a stretched string has a velocity of $10ms^{-1}$ and a frequency of 100 Hz. The phase difference between two particles of the string which are 2.5 cm apart will be

a) $\pi/8$ b) $\pi/4$ c) $3\pi/8$ d) $\pi/2$

766. When a stationary wave is formed then its frequency is

a) Same as that of the individual waves b) Twice that of the individual waves

c) Half that of the individual waves d) None of the above

767. A transverse wave is described by the equation $y = y_0\sin 2\pi\left[ft - \frac{x}{\lambda}\right]$.The maximum particle velocity is equal to four times the wave velocity if

a) $\lambda = \pi y_0/4$ b) $\lambda = 2\pi y_0$ c) $\lambda = \pi/y_0$ d) $\lambda = \pi y_0/2$

768. In open organ pipe, if fundamental frequency is v, then the other frequencies are

a) V,2v,3v,4v b) V,3v,5v c) V,2v,4v,8v d) None of these

769. A tube closed at one end and containing air is excited. It produces the fundamental note of frequency 512 Hz. If the same tube is open at both the ends the fundamental frequency that can be produced is

a) 1024 Hz b) 512 Hz c) 256 Hz d) 128 Hz

770. If the wave equation $y = 0.08\sin\frac{2\pi}{\lambda}(200t - x)$ then the velocity of the wave will be

a) $400\sqrt{2}$ b) $200\sqrt{2}$ c) 400 d) 200

771. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of the waves giving resonance with the fundamental, first and second overtones respectively of a closed organ pipe, then the ratio of $\lambda_1, \lambda_2, \lambda_3$ is

a) 1:3:5 b) 1:2:3 c) 5:3:1 d) $1:\frac{1}{3}:\frac{1}{5}$

772. An organ pipe is closed at one end has fundamental frequency of 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is

a) 14 b) 13 c) 6 d) 9

773. A man fires a bullet standing between two cliffs. First echo is heard after 3 seconds and second echo is heard after 5 seconds. If the velocity of sound is 330 m/s, then the distance between the cliffs is

a) 1650 m b) 1320 m c) 990 m d) 660 m

774. A bomb explodes on the moon. How long will it take for the sound to reach the earth?

a) 1000 s b) 1 day c) 10 s d) None of these

775. Two progressive waves having equation $x_1 = 3\sin\omega t$ and $x_2 = 4\sin(\omega t - 90°)$ are superimposed. The amplitude of the resultant wave is
a) 5 unit b) 1 unit c) 3 unit d) 4 unit

776. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is
a) $I_1 + I_2$ b) $\left(\sqrt{I_1} + \sqrt{I_2}\right)$ c) $\left(\sqrt{I_1} - \sqrt{I_2}\right)^2$ d) $2(I_1 + I_2)$

777. A pipe closed at one end and open at the other end, resonate with sound waves of frequency 135 Hz and also 165 Hz, But not with any wave of frequency intermediate between these two. Then the frequency of the fundamental note is
a) 30 Hz b) 15 Hz c) 60 Hz d) 7.5 Hz

778. Sound waves of v=600Hz fall normally on a perfectly reflecting wall. The shortest distance from the wall at which all particles will have maximum amplitude of vibration will be (speed of sound=$300ms^{-1}$)
a) $\frac{7}{8}m$ b) $\frac{3}{8}m$ c) $\frac{1}{8}m$ d) $\frac{1}{4}m$

779. In a resonance tube, using a tuning fork of frequency 325 Hz, two successive resonance length are observed as 25.4 cm and 77.4 cm respectively. The velocity of sound in air is
a) 338ms^{-1} b) 328ms^{-1} c) 330ms^{-1} d) 320ms^{-1}

780. The wave described by $y = 0.25\sin(10\pi x - 2\pi f)$ where x and y are in meters and t in seconds, is a wave travelling along the
a) Positive x direction with frequency 1 Hz and wavelength $\lambda = 0.2m$
b) Negative x direction with amplitude with amplitude 0.25 m and wavelength $\lambda = 0.2m$
c) Negative x direction with frequency 1 Hz
d) Positive x direction with frequency π Hz. and wavelength $\lambda = 0.2m$

781. A closed organ pipe of length L and open organ pipe contain gases of densities p_1 and p_2 respectively. The compressibility of gases 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) $\frac{L}{3}$ b) $\frac{4L}{3}$ c) $\frac{4L}{3}\sqrt{\frac{p_1}{p_2}}$ d) $\frac{4l}{3}\sqrt{\frac{p_2}{p_2}}$

782. A student is performing the experiment of Resonance Column. The diameter of the column tube is $4cm$. The frequency of the tuning fork is $512Hz$. The air temperature is 38°C in which the speed of sound is $336m/s$. The zero of the meter scale coincides with the top end of the Resonance column tube. When the first resonance occurs, the reading of the water level in the column is
a) 14.0 cm b) 15.2 cm c) 16.4 cm d) 17.6 cm

783. A string is rigidly tied at two ends and its equation of vibration is given by $y = \cos 2\pi\, t \sin 2\pi x$. Then minimum length of string is
a) 1 m b) $\frac{1}{2}m$ c) 5 m d) 2 πm

784. 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 from the fixed end of the string. The speeds of incident (and reflected) waves are
a) 5ms^{-1} b) 10ms^{-1} c) 20ms^{-1} d) 40ms^{-1}

785. Sound waves transfer
a) Only energy not momentum b) Energy
c) Momentum d) Both energy and momentum

786. A string is under tension so that its length is increased by $\frac{1}{n}$ times its original length. The ratio of fundamental frequency of longitudinal vibrations and transverse vibrations will be
a) $1:n$ b) $n^2:1$ c) $\sqrt{n}:1$ d) $n:1$

787. A column of air of length 50 cm resonates with a stretched string of length 40 cm. The length of the same air column which will resonates with 60 cm of the same string at a the same tension is
a) 100 cm b) 75 cm c) 50 cm d) 25 cm

788. A stone is dropped into a lake from a tower 500 *metre* high. The sound of the splash will be heard by the man approximately after
a) 11.5 seconds b) 21 seconds c) 10 seconds d) 14 seconds

789. A string in a musical instrument is 50 cm long and its fundamental frequency is 800 Hz. If a frequency of 1000 Hz is to be produced, the required length of string is
a) 62.5 cm b) 50 cm c) 40 cm d) 37.5 cm

790. Which of the following do not require medium for transmission
a) Cathode ray b) Electromagnetic wave
c) Sound wave d) None of the above

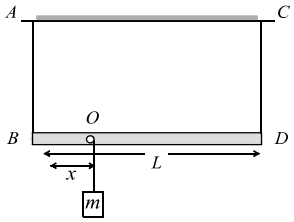
791. For simple harmonic vibrations $y_1 = 8\,cos\omega t$
$y_2 = 4\cos(\omega t + \frac{\pi}{2})$
$y_3 = 2\cos(\omega t + \pi)$
$y_4 = \cos\left(\omega t + \frac{3\pi}{2}\right)$ are superimposed on one another. The resulting amplitude and phase are respectively
a) $\sqrt{45}$ and $\tan^{-1}(\frac{1}{2})$ b) $\sqrt{45}$ and $\tan^{-1}\left(\frac{1}{3}\right)$ c) $\sqrt{75}$ and $\tan^{-1}(2)$ d) $\sqrt{75}$ and $\tan^{-1}(\frac{1}{3})$

792. If source and observer both are relatively at rest and if speed of sound is increased then frequency heard by observer will
a) Increases b) Decreases c) Can not be predicated d) Will not change

793. An open tube is in resonance with string (frequency of vibration of tube is n_0). If tube is dipped in water so that 75% of length of tube is inside water, then the ratio of the frequency of tube to string now will be
a) 1 b) 2 c) $\frac{2}{3}$ d) $\frac{3}{2}$

794. The wavelength of light observed on the earth from a moving star is found to decrease by 0.05%. the star is
a) Coming closer with a velocity of $1.5 \times 10^4 ms^{-1}$
b) Moving away with a velocity of $1.5 \times 10^4 ms^{-1}$
c) Coming closer with a velocity of $1.5 \times 10^5 ms^{-1}$
d) Moving away with a velocity of 1.5×10^{-1}

795. A massless rod is suspended by two identical strings AB and CD of equal length. A block of mass m is suspended from point O such that BO is equal to $''x''$ Further, it is observed that the frequency of 1st harmonic (fundamental frequency) in AB is equal to 2nd harmonic frequency in CD. Then, length of BO is



a) $\frac{L}{5}$ b) $\frac{4L}{5}$ c) $\frac{3L}{4}$ d) $\frac{L}{4}$

796. The Doppler's effect is applicable for
a) Light waves b) Sound waves c) Space waves d) Both (a) and (b)

797. Beats are the result of
a) Diffraction b) Destructive interference
c) Constructive and destructive interference d) Superposition of two waves of nearly equal frequency

798. A tuning fork arrangement (pair) produces 4 $beats/sec$ with one fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 $beats/sec$. The frequency of the unknown fork is
a) 286 cps b) 292 cps c) 294 cps d) 288 cps

799. A travelling wave represented by $y = a\sin(\omega t - kx)$ is superimposed on another wave represented by $y = a\sin(\omega t + kx)$. The resultant is
a) A standing wave having nodes at $x = \left(n + \frac{1}{2}\right)\frac{\lambda}{2}, n = 0,1,2$
b) A wave travelling along + x direction
c) A wave travelling along - x direction
d) A standing wave having nodes at $x = \frac{n\lambda}{2}; n = 0,1,2$

800. A source of sound of frequency 256 Hz is moving rapidly towards a wall with a velocity of $5m/s$. The speed of sound is 330 m/s. If the observer is between the wall and the source, then beats per second heard will be
a) 7.8 Hz b) 7.7 Hz c) 3.9 Hz d) Zero

801. The speed of a wave on string 150 $ms^{-1}$when the tension is 120 N. the percentage increase in the tension in order to raise the wave speed by 20% is
a) 44% b) 40% c) 20% d) 10%

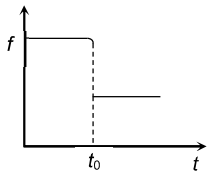
802. If the phase difference between the two wave is 2π during superposition, then the resultant amplitude is
a) Maximum b) Minimum
c) Maximum or minimum d) None of the above

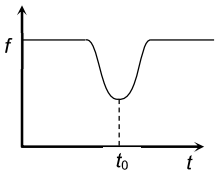
803. A closed organ pipe and an open organ pipe are tuned to the same fundamental frequency. The ratio of their length is
a) 1:1 b) 2:1 c) 1:4 d) 1:2

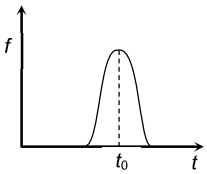
804. An observer is moving towards the stationary source of sound, then
a) Apparent frequency will be less than the real frequency
b) Apparent frequency will be greater than the real frequency
c) Apparent frequency will be equal to real frequency
d) Only the quality of sound will charge

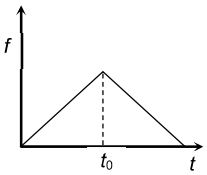
805. A man is standing on the platform and one train is approaching and another train is going away with speed of4 ms^{-1}, frequency of sound produced by train is 240 Hz. What will be the number of beats heard by him per second?
a) 12 b) Zero c) 6 d) 3

806. An open pipe is in resonance in its 2nd harmonic with tuning fork of frequency f_1. Now it is closed at one end. If the frequency of the tuning fork is increased slowly from f_1 then again a resonance is obtained with a frequency f_2. If in this case the pipe vibrates n^{th} harmonics then
a) $n = 3, f_2 = \frac{3}{4}f_1$ b) $n = 3, f_2 = \frac{5}{4}f_1$ c) $n = 5, f_2 = \frac{5}{4}f_1$ d) $n = 5, f_2 = \frac{3}{4}f_1$

807. A man is standing on a railway platform listening to the whistle of an engine that passes the man at constant speed without stopping. If the engine passes the man at time t_0. How does the frequency f of the whistle as heard by the man changes with time
a) 

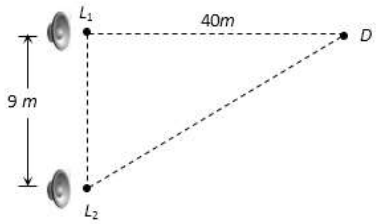
b) 

c) 

d) 

808. Beats are produced by two waves given by $y_1 = a\sin 2000\pi t \; and \; y_2 a\sin 2008\pi t$. The number of beats heard per second is
a) Zero b) One c) Four d) Eight

809. Two loudspeakers L_1 and L_2 driven by a common oscillator and amplifier, are arranged as shown. The frequency of the oscillator is gradually increased from zero and the detector at D records a series of maxima and minima. If the speed of sound is 330 ms^{-1} then the frequency at which the first maximum is observed is



a) 165 Hz b) 330 Hz c) 496 Hz d) 660 Hz

810. "Stationary waves" are so called because in them
a) The particles of the medium are not disturbed at all
b) The particles of the medium do not execute SHM
c) There occurs no flow of energy along the wave
d) The interference effect can't be observed