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C .U .Q

CHARACTERISTICS OF PROGRESSIVE WAVE

1. **When a wave is travelling in a medium, in that process, the following is/are transporting from one particle to other**
 1) energy 2) momentum
 3) both 1 & 2 4) length

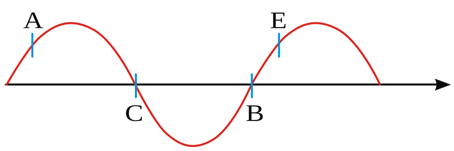
2. **A plane progressive wave cannot be represented by**
 1) $y = a\sin(\omega t \pm kx)$
 2) $y = a\sin 2\pi\left(\frac{t}{T} \mp \frac{x}{\lambda}\right)$
 3) $y = a\sin \frac{2\pi}{\lambda}(Vt \mp x)$
 4) $y = A\log x + B\log x$

3. **The speed of wave of time period T and propagation constant K is**
 1) $\frac{2\pi}{TK}$ 2) $\frac{TK}{2\pi}$ 3) $\frac{1}{TK}$ 4) $\frac{T}{K}$

4. **The phase change between incident and reflected sound wave from a fixed wall is**
 1) 0 2) π 3) 3π 4) 2π

5. **The phase change between incident and reflected sound wave from a free end is**
 1) 0 2) π 3) 3π 4) $\pi/2$

6. **Figure shows the shape of a string, the pairs of points which are in opposite phase is**



 1) A and B 2) B and C 3) C and E 4) A and E

7. **During propagation of longitudinal plane wave in a medium the two particles separated by a distance equivalent to one wavelength at an instant will be/have**
 1) in phase, same displacement
 2) in phase, different displacement
 3) different phase, same displacement
 4) different phase, different displacement

8. **The equation of a progressive wave is Y=a sin (ωt-kx), then the velocity of the wave is**
 1) kω 2) k/ω 3) ω/k 4) aω

9. **When a progressive wave is propagating in a medium, at a given instant, two particles which are separated by three wave lengths will have.....**
 1) Different displacement in same direction
 2) Different displacement in opposite direction
 3) Same displacement in opposite direction
 4) Same displacement in same direction

10. **The speed of sound in a medium does not change with the change of**
 1) frequency 2) wave length
 3) pressure 4) density

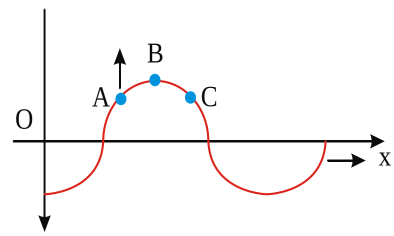
11. **Phase difference between a particle at a compre-ssion and a particle at the next rarefaction is**
 1) Zero 2) $\pi/2$ 3) π 4) $\pi/4$

12. **One similarity between sound and light waves is that.**
 1) both can propagate in vacuum
 2) both have same speed
 3) both can show polarization
 4) both can show interference

13. **When a body is undergoing undamped vibration, the physical quantity that remains constant is**
 1) amplitude 2) velocity
 3) acceleration 4) phase

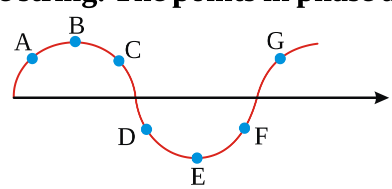
SPEED OF A TRAVELLING WAVE

14. **At any instant a wave travelling along the string is shown in figure. Here, if point A is moving upward, the true statement is**



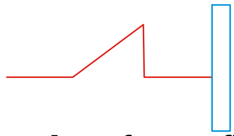
 1) the wave is travelling to the right
 2) the displacement amplitude of wave is equal to displacement of B at this instant
 3) at this instant, C also directed upward
 4) 1 and 3

15. **Transverse waves are produced in a long string by attaching its free end to a vibrating tuning fork. Figure shows the shape of a part of the string. The points in phase are**

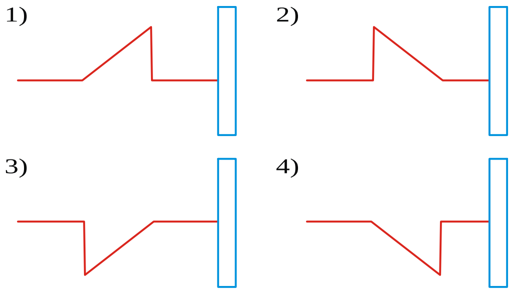


 1) A and D 2) B and E
 3) C and F 4) A and G

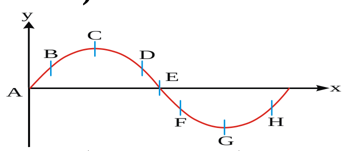
16. A pulse in a rope approaches a solid wall and it gets reflected from it



The wave pulse after reflection is best represented by _____



17. A transverse wave is travelling along a string from left to right. The figure below represents the shape of the string at a given instant. At this instant the points have an upward velocity are (here X-wave displacement, Y-particle displacement)



1) D,E,F 2) A,B,H 3) B,D,F 4) A,E,H

18. A metal string is fixed between rigid supports. It is initially at negligible tension. It's Young's modulus is 'Y' density is ρ and coefficient of linear expansion is α. It is now cooled through a temperature 't', transverse waves will move along it with a speed.

1) $\sqrt{\frac{Y\alpha t}{\rho}}$ 2) $Y\sqrt{\frac{\alpha t}{\rho}}$ 3) $\alpha\sqrt{\frac{Yt}{\rho}}$ 4) $t\sqrt{\frac{\rho}{Y\alpha}}$

PRINCIPLE OF SUPER POSITION, INTERFERENCE AND STATIONARY WAVES ON STRETCHED STRINGS.

19. The interference phenomenon can take place

1) in transverse wave
2) in longitudinal wave
3) in electromagnetic waves
4) in all waves

20. For superposition of two waves, the following is correct

1) they must have the same frequency and wavelength
2) they must have equal frequencies but may have unequal wavelengths
3) they must have the same wave-length, but may have different frequencies
4) they may have different wavelength and different frequencies

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

1) sinusoidal shape with amplitude A/3
2) sinusoidal shape with amplitude A/2
3) sinusoidal shape with amplitude A
4) straight line

22. When stationary waves are set up, pick out the correct statement from the following

1) all the particles in the medium are in the same phase of vibration at all times and distances
2) the particles with an interval between two consecutive nodes are in phase, but the particles in two such consecutive intervals, are of opposite phase
3) the phase lag along the path of the wave increases as the distance from the source increases
4) only antinodes are in same phase

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

1) zero at the antinodes
2) maximum at the antinodes
3) zero at the nodes
4) maximum at the nodes

24. In a stationary wave

1) phase is same at all points in a loop
2) amplitude is same at all points
3) energy is constant at all points
4) temperature is same at all points

25. A wave is represented by an equation; Y = A cos kx sin ωt, then

1) it is a progressive wave with amplitude A
2) it is a progressive wave with amplitude A cos kx
3) it is a stationary wave with amplitude A
4) it is a stationary wave with amplitude A cos kx

26. In a stationary wave

1) pressure change is maximum at nodes
2) pressure change is maximum at antinodes
3) pressure change is minimum at nodes
4) amplitude is zero at all points

27. A wire in sonometer experiment is vibrating in the third overtone. There are

1) two nodes, two antinodes
2) three nodes, three antinodes
3) four nodes, three antinodes
4) five nodes, four antinodes.

28. λ is maximum wavelength of a transverse wave that travels along a stretched wire whose two ends are fixed. The length of that wire is

1) 2λ 2) λ 3) $\lambda/2$ 4) $3\lambda/2$

29. In the sonometer experiment, a wire of density 'ρ' and radius 'a' is held between two bridges at a distance 'L' apart. Tension in the wire is 'T' the fundamental frequency of the wire will be

1) $\frac{1}{2L}\sqrt{\frac{\pi a^2}{T\rho}}$ 2) $\frac{1}{2L}\sqrt{\frac{T\rho}{\pi a^2}}$

3) $\frac{1}{2L}\sqrt{\frac{T}{\pi a^2}}$ 4) $\frac{1}{2L}\sqrt{\frac{T}{\pi a^2 \rho}}$

30. For a stretched string of given length, the tension 'T' is plotted on the X-axis and the frequency 'f' on the Y -axis. The graph is

1) rectangular hyperbola
2) straight line through the origin
3) parabola
4) straight line not through the origin

31. The equation of a stationary wave in a medium is given as $y = \sin \omega t \cos kx$. The length of a loop in fundamental mode is

1) $\frac{\pi}{2K}$ 2) $\frac{\pi}{K}$ 3) $\frac{2\pi}{K}$ 4) $\frac{K}{\pi}$

32. A stretched string of length l, fixed at both ends, can sustain stationary waves of wavelength λ, correctly given by(P is number of loops)

1) $\lambda = \frac{l^2}{2p}$ 2) $\lambda = \frac{p^2}{2l}$ 3) $\lambda = 2lp$ 4) $\lambda = \frac{2l}{p}$

33. A knife-edge divides a sonometer wire into two parts. The fundamental frequencies of the two parts are n_1 and n_2. The fundamental frequency of the sonometer wire when the knife-edge is removed will be

1) $n_1 + n_2$ 2) $\frac{1}{2}(n_1+n_2)$ 3) $\sqrt{n_1 n_2}$ 4) $\frac{n_1 n_2}{n_1+n_2}$

SOUND AND VELOCITY OF SOUND

34. Pitch of sound primarily depend upon

1) intensity 2) frequency
3) quality 4) overtone

35. Quality of sound primarily depends upon

1) intensity 2) frequency
3) shape of the source 4) wave form

36. It is possible to recognize a person by hearing his voice even if he is hidden behind a solid wall. This is due to the fact that his voice

1) Has a definite pitch
2) Has a definite quality
3) Has a definite loudness
4) Can penetrate the wall

37. The relation between the intensity (I) of a wave and on the distance (r) from a line source is

1) $I \propto r^{-1}$ 2) $I \propto r^{-2}$ 3) $I \propto r$ 4) $I \propto r^{-1/2}$

38. Loudness of sound primarily depend upon

1) intensity 2) frequency
3) shape of the source 4) overtone

39. According to Laplace correction, the propagation of sound in gas takes place under

1) isothermal condition 2) isobaric condition
3) isochoric condition 4) adiabatic condition

40. The velocity of sound is not affected by change in

1) temperature 2) medium
3) pressure 4) wavelength

41. Velocity of sound in air at the given temperature

1) decreases with increase in pressure
2) may increase on decrease with pressure
3) is independent of the variation in pressure
4) varies directly as the square root of pressure

42. If the temperature of atmosphere is increased the following character of sound waves is effected

1) amplitude 2) frequency
3) velocity 4) wavelength

43. Velocity of sound is

1) directly proportional to absolute temperature
2) directly proportional to square root of absolute temperature
3) inversely proportional to absolute temperature
4) inversely proportional to $\sqrt{T}$

ORGAN PIPES

44. A closed pipe has certain frequency. Now its length is halved. Considering the end correction, its frequency will now become

1) double 2) more than double
3) less than double 4) four times

45. The fundamental frequency of a closed organ pipe is 'n'. Its length is doubled and radius is halved. Its frequency will become nearly.

1) $\frac{n}{2}$ 2) $\frac{n}{3}$ 3) n 4) 2n

46. **When an air column of length 'l' open at both ends produces its fundamental note, the wavelength is given by**
1) $\lambda = l$ 2) $\lambda = 2l$ 3) $\lambda = 4l$ 4) $\lambda = 3l$

47. **In the case of closed end organ pipe**
1) the maximum possible wavelength is same as that of open end organ piple
2) the maximum possible wavelength is less than that of open end organ pipe
3) the maximum possible wavelength may be less than that of open end organ pipe
4) the maximum possible wavelength is greater than that of open end organ pipe

48. **In the case of standing waves in organ pipe, the value of $\frac{\partial y}{\partial x}$ at the open end is**
1) >0 2) <0 3) =0 4) =10

49. **The harmonics formed in air column in an organ pipe closed at one end are**
1) only odd 2) only even
3) both odd and even 4) neither odd nor even

50. **A tube with both ends closed has same set of natural frequency as**
1) one end closed organ pipe
2) both end open organ pipe
3) vibratory string fixed at both ends
4) vibratory string fixed at one end

51. **The frequency of the sound emitted by an organ pipe will increase if the air in it is replaced by**
a) hot air b) moist air c) hydrogen
1) a is true 2) a,b are true
3) b,c are true 4) a,b,c are true

52. **An empty vessel is filled partially with water natural frequency**
1) increase 2) decrease
3) remains unchanged 4) insufficient data

53. **End correction in a closed organ pipe of diameter 'd' is**
1) 0.6d 2) 1.2d 3) 0.3d 4) 2.4d

54. **If oil of density higher than that of water is used in place of water in a resonance tube, its frequency will**
1) increase 2) decrease
3) remain the same
4) depend upon the density of the material of tube

55. **If λ_1, λ_2 and λ_3 are wave lengths of the waves giving resonance with fundamental ,first and second over tones of a closed organ pipe .the ratio of wave lengths $\lambda_1 : \lambda_2 : \lambda_3$ is**
1) 1:2:3 2) $1:\frac{1}{3}:\frac{1}{5}$ 3) 1:3:5 4) 5:3:1

56. **In closed pipes, the positions of antinodes are obtained at ____**
1) $\frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}$ 2) $0, \frac{\lambda}{2}, \lambda$
3) $\lambda, 2\lambda, 3\lambda$ 4) $2\lambda, 4\lambda, 6\lambda$

57. **An open pipe of length 'l' vibrates in fundamental mode. The pressure variation is maximum at**
1) 1/4 from ends 2) the middle of pipe
3) the ends of pipe 4) at 1/8 from ends of pipe

BEATS

58. **Beat phenomenon is physically meaningful only, if**
1) $|\omega_1 - \omega_2| >> |\omega_1 + \omega_2|$ 2) $|\omega_1 - \omega_2| << |\omega_1 + \omega_2|$
3) $\frac{\omega_1}{\omega_2} < 17$ 4) $|\omega_1 + \omega_2| >> \frac{\omega_1}{\omega_2}$

59. **Beats are produced by the superposition of two waves of nearly equal frequencies. Of the following, the correct statement is**
1) all particles of the medium vibrate simple harmonically with frequency equal to the difference between the frequencies of component waves
2) the frequency of beats changes with the location of the observer
3) the frequency of beats changes with time
4) amplitude of vibration of particle at any point changes simple harmonically with frequency equal to one half of the difference between the component waves

60. **When beats are formed by two waves of frequencies n_1 and n_2, the amplitude varies with frequency equal to**
1) n_1-n_2 2) 2(n_1-n_2)
3) (n_1-n_2)/2 4) (n_1+n_2)/2

61. **Two wires are producing fundamental notes of same frequency. The change in which of the following factors of one wire does not produce beats between them**
1) stretching force 2) diameter of the wire
3) material of the wire
4) amplitude of the vibrations

62. **Beats are the result of**
1) diffraction 2) destructive interference
3) constructive and destructive interference
4) superposition of two waves of nearly equal frequencies

63. **To hear beats, it is essential that the two sound waves in air should**
1) be travelling in opposite directions
2) be travelling in the same direction
3) have slightly different amplitude
4) have slightly different wavelengths

64. **When the two tuning forks of nearly same frequency are vibrated to produce beats, then the velocity of propagation of beats will be**
1) less than that of sound
2) depend upon the relative frequency
3) more than that of sound
4) equal to that of sound

65. **A certain number of beats are heard when two tuning forks of natural frequencies n_1 and n_2 are sounded together. The number of beats when one of the forks is loaded**
(1992)
1) increases 2) decreases
3) remains same
4) may increase or decrease

66. **The frequency of sound reaching a stationary listener behind a moving source is**
1) lower than source frequency
2) higher than source frequency
3) zero
4) same as the frequency of the source

DOPPLER EFFECT

67. **Doppler shift in frequency does not depend upon**
1) the frequency of wave produced
2) the speed of the source
3) distance between source and observer
4) the speed of the observer

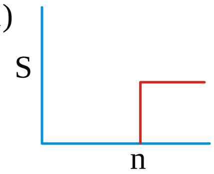
68. **An observer is moving away from a source at rest. The pitch of the note heard by the observer is less because**
1) the pitch of the source decreases
2) the velocity of sound in air increases
3) wave length of the wave becomes small
4) wavelength of the wave remains unchanged but observer receives less number of waves

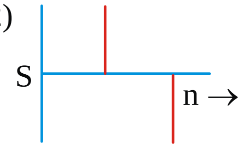
69. **Doppler effect is not applicable to**
1) sound Waves 2) light Waves
3) radio Waves 4) matter Waves

70. **In Doppler effect, when a source moves towards a stationary observer, the apparent increase in frequency is due to**
1) increase in wavelength of sound received by observer
2) decrease in wavelength of sound received by obzerver
3) increase in number of waves received by observer in one second
4) decrease in number of waves received by observer in one second

71. **When a source moves away from stationary observer with velocity v then apparent change in frequency is Δn_1. When an observer approaches the stationary source with same velocity v then change in frequency is Δn_2 then**
1) $\Delta n_1 = \Delta n_2$ 2) $\Delta n_1 > \Delta n_2$
3) $\Delta n_1 < \Delta n_2$ 4) $\frac{\Delta n_1}{\Delta n_2} < 1$

72. **The graph between distance between source and observer and apparent frequency in the case of Doppler's effect will be**

1)


2)


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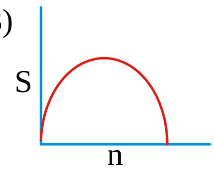
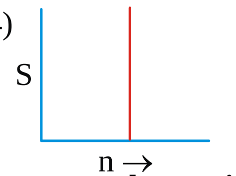


4)


73. **A source of sound moves towards a stationary listener. The apparent pitch of the sound is found to be higher than its actual value. This happens because**
1) wavelength of sound waves decreases
2) wavelength of sound waves increases
3) the number of waves received by the listener increases
4) the number of waves received by the listener decreases

ASSERTION & REASON

In each of the following questions, a statement is given and a corresponding statement or reason is given just below it. In the statements, mark the correct answer as
1) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
3) Assertion is true but Reason is false.
4) Assertion is false but Reason is true..

74. **Assertion (A): In transverse wave particle velocity is perpendicular to wave velocity.**
Reason(R): In a longitudinal wave particle velocity is along the direction of propagation of wave.

75. Assertion (A): When a sound wave is propagating through the medium the acceleration of a particle is directly proportional to its displacement.

Reason(R): Wave velocity depends on the properties of the medium and is independent of time and position.

76. Assertion (A):When a transverse wave propagates along a string it transports energy in two forms : kinetic energy and potential energy.

Reason(R): A transverse pulse reflected from a fixed end gets inverted.

77. Assertion (A):When a wave is transmitted from one medium to another, the frequency does not change.

Reason(R): A wave transports energy and momentum along with matter.

78. Assertion (A):Mechanical waves require material medium for their propagation.

Reason(R): Transverse waves cannot be generated with in the liquids.

79. Assertion (A):The wave reflected from a denser medium has a phase change of π from the incident wave.

Reason(R): The rate of energy transfer by a wave is proportional to the frequency.

80. Assertion (A): A pulse traveling in one rope is reflected at the boundary with another rope. If the reflected pulse is not inverted, then the transmitted pulse is longer than the original pulse.

Reason(R): The speed of a transverse wave in an elastic stretched string is doubled if extension in the string is quadrapled.

81. Assertion (A): When a sound wave is propagating through the medium, the pressure fluctuations are $\pi/2$ out of phase with the displacements.

Reason(R): When a sound wave is propagating through the medium maximum pressure deviation occurs at the positions of zero displacement and no pressure change occur at the positions of maximum displacements.

82. Assertion (A): The speed of sound in moist air is more than that in dry air.

Reason(R): Speed of sound is independent of change in pressure at constant temperature.

83. Assertion (A): The Doppler formula is not symmetric with respect to the speed of source and the speed of observer.

Reason(R): Doppler effect is applicable for both mechanical as well as electromagnetic waves.

84. Assertion (A): In propagation of sound waves, pressure amplitude is proportional to the displacement amplitude.

Reason(R): Suppose the source and observer both are stationary and wind is blowing in a direction from source to observer, then the observer detects an apparent increase in frequency.

85. Assertion (A): In stationary wave, all the particles of the medium between two nodes vibrate in same phase with same frequency but with different amplitude.

Reason(R): In stationary wave, every particle of the medium vibrates with its own energy and it does not share or transmit it to any other particle.

86. Assertion (A): In the phenomena of superposition, each wave propagates as if the other wave were not present.

Reason(R): The superposition of waves is valid only when the amplitude of the wave is much less than the wave length and velocity of the wave is much longer than the particle velocity.

87. Assertion (A):A standing wave can be produced even if the component waves have different amplitude.

Reason(R): Only periodic waves can produce interference.

88. Assertion (A): Displacement node is a pressure antinode.

Reason(R): Standing waves can only be transverse.

89. Two points P and Q have a phase difference of π when a traveling sine wave passes through the region.

Assertion (A): P and Q move in opposite directions.

Reason(R): P oscillates at half the frequency of Q.

90. Assertion (A): A transverse wave is traveling in a string. Equation of the wave is equal of shape of the string at an instant t.
Reason(R): At a point beats frequency of n Hz is observed. It means, at that point, zero intensity is observed 2n times per second.

91. Assertion (A): In case of longitudinal stationary wave, compressions and rarefractions are obtained in place of nodes & antinodes respectively.
Reason(R): Two plane waves, one longitudinal and the other transverse having same frequency and amplitude are traveling in medium in opposite directions with same speed forms a stationary wave.

92. Assertion (A): If all the particles of a string are oscillating in same phase, the string is resonating in its fundamental tone.
Reason(R): A sound wave is propagating through the medium, when the particle moves in the opposite direction to the propagation of the wave, it is in a region of rarefaction.

93. Assertion (A): In longitudinal progressive waves, when the particle is at the mean position, it is a region of maximum compression or rarefaction.
Reason(R): In longitudinal progressive waves, compressions and rare fractions travel forward along the wave.

94. Assertion (A): In progressive waves, the minimum distance between two particles vibrating in phase is equal to the wavelength.
Reason(R): In progressive waves, all particles have the same amplitude, frequency and time period.

95. Assertion (A): The intensity of sound increases with increase in the density of the medium.
Reason(R): The sound heard is more intense in carbon dioxide in comparison to air.

96. Assertion (A): The velocity of sound increases with increase of temperature.
Reason(R): Sound wave travel through longer distances during night than during day.

97. Assertion (A): The velocity of sound is generally greater in solids than in gases at NTP.
Reason(R): The ratio of modulus of elasticity to density for solids is much greater than that for gases.

98. Assertion (A): Beats can be observed by two light sources as in sound.
Reason(R): To observe beats by two light sources, the phase difference between the two sources should change regularly.

99. Assertion (A): When a vibrating tuning fork is placed on a sonometer, a large sound is heard. Reason(R): It is due to resonance.

100. Assertion (A): When the star approaches the earth, the spectral lines are shifted towards the blue end of the spectrum.
Reason(R): It is due to Doppler effect.

101. Assertion (A): The change in frequency due to Doppler effect does not depend on separation between the source and the observer.
Reason(R): When a listener and sound source are moving with the same velocity in the same direction, the apparent frequency as heard by listener increases.

102. Assertion (A): The Doppler effect can be observed in case of light and sound, but Doppler effect formula for light differs from that for sound.
Reason(R): Light does not require a material medium for its transmission whereas sound requires medium for its transmission.

103. Assertion (A): In a standing wave, the particles at nodes always remain in rest.
Reason(R): In a standing wave, all the particles cross their mean positions together.

104. Assertion (A): In a travelling wave, energy is transmitted from one region of space to other but in a standing wave the energy of one region is always confined that region.
Reason(R): In a travelling wave, the phases of nearly particles are always different, whereas in a standing wave all particles between two successive nodes move in phase.

105. Assertion (A):Solids can support both longitudinal and transverse waves, but only longitudinal waves can propagate in gases.
Reason(R): Solid possess elasticity of length as well as shape, but gases possess only Bulk modulus.

106. Assertion (A): A driver under water is unable to hear the sound produced in air.
Reason(R): The sound produced in air undergoes reflection at the water surface.

107. Assertion (A): We need two ears to locate the direction from which the sound is coming.
Reason(R): The phase difference between the sound reaching the two ears depends on the direction and distance of source.

108. Assertion (A): The sound waves do not exhibit the property of polarization.
Reason(R): The sound waves do not have the transverse nature.

109. Assertion (A): Two pulses are traveling along a uniform string in opposite directions. One of them is inverted pulse when compared with the other in shape. There is no point clamped between the pulses. Then they will have different speeds.
Reason(R): In a uniform string under a given tension, wave speed of any pulse is same.

110. Two waves in a string (all in SI units)are $y_1 = 0.6\sin(10t - 20x)$ and $y_2 = 0.4\sin(10t + 20x)$.
Mass per unit length of the string is $10^{-2}\dfrac{kg}{m}$.
Assertion (A): Stationary wave can be formed by their superposition but net energy transfer through any section will be non-zero.
Reason(R): Their amplitudes are unequal.

111. Assertion (A): When a longitudinal pressure wave is reflected at the open end of an organ pipe, the compression pressure wave pulse becomes rarefraction pressure wave pulse during the reflection.
Reason(R): The phase of the wave changes by π when reflected at the open end.

112. Assertion (A): An open organ pipe of certain length have the same fundamental frequency as closed organ pipe of half the length
Reason(R): In the case of open organ pipe, at both the ends antinodes are formed, while in the closed organ pipe at one end antinode and at the other end node is formed

113. Assertion (A) When a traveling wave is sent along a particular string by oscillating one end, the speed of the wave will increase if we increase the frequency of oscillations.
Reason(R): If a traveling wave sent along a particular string by oscillating its one end, it is the wave length of the wave that decreases.

MATCH THE FOLLOWING

114. Match the following :

List – I	List – II
In a stretched string %	Change in frequency
a) Length increases by 2%	e) Decreases by 4%
b) Radius increases by 4%	f) Increases by 4%
c) Tension increases by 2%	g)Decreases by 4%
d) Density decreases by 2%	h)Increases by 8%
	I) Changes by 8%

The correct match is
1) a-g, b-e, c-h, d-f 2) a-h, b-i, c-g, d-h
3) a-e, b-g, c-f, d-h 4) a-f, b-i, c-e, d-g

115. Match the following :

List – I	List – II
a) Resonance	e)Law of conservation of energy
b) Reflection	f) Doppler effect is due to change in wave length
c) Source is in motion	g) Doppler effect is due to number of waves reaching the observer
d) Observer is in motion	h) Special case of forced vibrations
	i) Reverberation

The correct match is
1) a-e, b-h, c-g, d-i 2) a-f, b-g, c-e, d-h
3) a-g, b-h, c-e, d-f 4) a-h, b-i, c-f, d-g

116. I represent intensity of sound wave, A the amplitude and r the distance from the source. Then the match the following two comlumns.

Column - I	Column - II
a) Intensity due to a point source.	p) Proportional to $r^{-1/2}$
b) Amplitude due to a point source.	q) Proportional to r^{-1}
c) Intensity due to a line source	r) Proportional to r^{-2}
d) Amplitude due to a line source	s) Proportional to r^{-4}

1) a-r,b-q,c-q,d-p 2) a-p,b-q,c-r,d-s
3) a-q,b-q,c-s,d-r 4) a-s,b-p,c-q,d-r

117. Transverse waves are produced in a stretched wire. Both ends of the string are fixed. Let us compare between second overtone mode(in numerator) and fifth harmonic mode(in denominator). Match the following two columns.

Column - I	Column - II
(a) Frequency ratio	(p) 2/3
(b) Number of nodes ratio	(q) 4/5
(c) Number of antinodes ratio	(r) 3/5
(d) Wavelength ratio	(s) 5/3

1) a-r,b-p,c-r,d-s 2) a-q,b-p,c-s,d-s
3) a-r,b-s,c-q,d-p 4) a-s,b-p,c-r,d-p

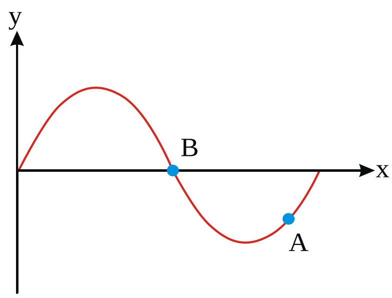
118. A wave travels from a denser medium to rarer medium, then match the following two columns.

Column - I	Column - II
(a) speed of wave	(p) will increase
(b) wavelength of wave	(q) will decrease
(c) amplitude of wave	(r) will remain constant
(d) frequency of wave	(s) may increase or decrease

1) a – r; b – p; c – r; d – s 2) a – p; b – p; c – p; d – r

3) a – r; b – s; c – q; d – p 4) a – s; b – p; c – r; d – p

119. y-x graph of a transverse wave at a given instant is shown in figure. match the following two columns.



Column - I	Column - II
(a) velocity of particle A	(p) positive
(b) acceleration of particle A	(q) negative
(c) velocity of particle B	(r) zero
(d) acceleration of particleB	(s) cen't tell

1) a-r,b-p,c-r,d-s 2) a-p,b-p,c-p,d-r

3) a-r,b-s,c-q,d-p 4) a-s,b-p,c-s,d-r

120. Match the following

Column-I	Column-II
A) Laplace equation	P) humidity
B) Newton equation	Q) $\sqrt{\frac{\gamma p}{d}}$
C) Speed of longitudinal wave depends on	R) Temperature
	S) isothermal process
	T) $\sqrt{\frac{P}{d}}$

	A	B	C
1)	P	Q	S,T
2)	Q	S,T	P,R
3)	P,Q	R,S	T
4)	Q,R	P,Q,R	R,S

121. A tuning fork 'P' of frequency 280 Hz produces 6 beats/s with unknown tuning fork 'Q'

Column-I	Column-II
A) P is waxed and number of beats decreases	P) Frequency of 'Q' is 286 Hz
B) Q is filed and numbered beats decreases	Q) Frequency of 'Q' is 274 Hz
C) P is filed and number of beats remains same	R) Frequency of'Q' is 272 Hz
D) 'Q' is filed and number of beats	S) Frequency 'Q' is 288 Hz

	A	B	C	D
1)	Q	R	S	R
2)	P	P	Q	Q
3)	P,Q	Q,R	R,S	P
4)	R,S	Q,R	S	R

122. Match the following

Column-I	Column-II
A) Beats	P) Ratio of harmonics is 1:2:3
B) open organ pipe	Q) Transverse stationary waves
C) string stretched at both ends	R) Superposition of sound waves of nearly equal frequencies
D) closed organ pipe	S) longitudinal stationary waves
	T) Interference in time

	A	B	C	D
1)	P,T	P,S	P,Q	S
2)	Q,R	S,T	R,S,T	Q
3)	S,T	Q,R,T	P	Q
4)	Q	P,Q	R,S	T

123. A string of length 1m stretched at both ends vibrating with frequency 300 Hz which is 3 times the fundamental frequency

Column-I	Column-II
A) Number of loops	P) $\frac{1}{3}m$
B) Number of antinodes	Q) 200 Hz
C) Distance between two successive antinodes	R) 1st overtone
D) 2nd harmonic	S) 3

	A	B	C	D
1)	Q	R,S	P,R	Q,S
2)	T	Q,R	P	S,T
3)	P,Q	R,S	P,R,T	Q
4)	S	S	P	Q,R

MORE THAN ONE OPTION IS CORRECT

124. A string of length l is stretched along the x-axis and is rigidly clamped at x=0 and x=l. Transverse vibrations are produced in the string. For n^{th} harmonic which of the following relations may represent the shape of the string at any time

a) $y = 2A\cos\omega t\ \cos\left(\frac{n\pi x}{l}\right)$

b) $y = 2A\sin\omega t\ \cos\left(\frac{n\pi x}{l}\right)$

c) $y = 2A\cos\omega t\ \sin\left(\frac{n\pi x}{l}\right)$

d) $y = 2A\sin\omega t\ \sin\left(\frac{n\pi x}{l}\right)$

1) c only 2) c and d only
3) a only 4) a, b, c and d

125. In case of superposition of waves (at x=0), y_1=4sin(1026 π t) and y_2=2sin(1014 π t)
a) the frequency of resulting wave is 510 Hz
b) the amplitude of resulting wave varies at frequency 3 Hz
c)the frequency of beats is 6 per second
d) the ratio of maximum to minimum intensity is 9
The correct statements are
1) a, d 2) b, d 3) a, c, d 4) all

126. In case of stationary sound waves in air the correct statement(s) is a/are
A) each air particle vibrates with the same amplitude
B) amplitude is maximum for some particles and minimum for some other particles
C) the particles do not execute periodic motion
D) the particles do not vibrate at all
1) A 2) B 3) C 4) B & C

127. The tension in a stretched string fixed at both ends is changed by 2%, the fundamental frequency is found to get changed by 15 Hz.
a) wavelength of the string of fundamental frequency does not change
b) velocity of propagation of wave changes by 2%
c) velocity of propagation of wave changes by 1%
d) original frequency is 1500 Hz
1) c only correct 2) c and d are correct
3) a, c and d are correct 4) b and d are correct

128. A wave y = Acos(ω t – kx) passes through a medium. If v is the particle velocity and a is the particle acceleration then,
a) y, v and a all are in the same phase
b) y lags behind v by a phase angle of π/2
c) a leads y by a phase angle of π
d) v leads a by a phase angle of $\frac{3\pi}{2}$
1) a only correct 2) b and c are correct
3) a, b, c are correct 4) b and d are correct

129. The equation of the standing wave in a string clamped at both ends, vibrating in its third harmonic is given by
$y = 0.4\sin(0.314x)\cos(600\pi t)$
where, x and y are in cm and t in sec.
a) the frequency of vibration is 300 Hz
b) the length of the string is 30 cm
c) the nodes are located at $x = 0$, 10 cm, 30 cm
1) Only a is true 2) a, b are true
3) b, c are true 4) a, b, c are true

130. The equation of a stationary wave in a string is $y = (4mm)\sin\left[(3.14m^{-1})x\right]\cos\omega t$.
Select the correct alternative(s) :
a) the amplitude of component waves is 2 mm
b) the amplitude of component waves is 4mm
c) the smallest possible length of string is 0.5 m
d) the smallest possible length of string is 1.0 m
1) a, c are correct 2) b, c are correct
3) a, d are correct 4) all are correct

CUQ - KEY

1) 3	2) 4	3) 1	4) 2	5) 1	6) 1
7) 1	8) 3	9) 4	10) 1	11) 3	12) 4
13) 1	14) 2	15) 4	16) 3	17) 1	18) 1
19) 4	20) 4	21) 4	22) 2	23) 4	24) 1
25) 4	26) 1	27) 4	28) 3	29) 4	30) 3
31) 2	32) 4	33) 4	34) 2	35) 4	36) 2
37) 2	38) 1	39) 4	40) 3	41) 3	42) 3
43) 2	44) 3	45) 1	46) 2	47) 4	48) 3
49) 4	50) 2	51) 4	52) 1	53) 3	54) 3
55) 2	56) 1	57) 2	58) 2	59) 4	60) 3
61) 4	62) 4	63) 4	64) 4	65) 4	66) 1
67) 3	68) 4	69) 4	70) 2	71) 3	72) 4
73) 1	74) 2	75) 2	76)2	77)3	78)2
79)3	80)4	81)1	82)2	83)2	84)3
85)3	86)2	87)3	88)3	89)3	90)2
91)3	92)2	93)3	94)2	95)3	96)3
97)1	98)1	99)1	100)1	101)3	102)1
103)3	104)2	105)1	106)1	107)1	108)1
109)4	110)1	111)1	112)2	113)4	114)1
115)4	116)1	117)1	118)2	119)4	120)2
121)2	122)1	123)4	124)2	125)1	126)2
127)3	128) 4	129)4	130)3		