PHYSICS

BOOKS - PREMIERS PUBLISHERS

WAVES

Evalution Textbook Questions And Answers Multiple Choice Questions

1. A student tunes his guitar by striking a 120 Hertz with a tuning fork, and simultaneously

plays the 4^{th} string on his guitar. By keen observation, he hears the amplitude of the combined sound oscillating thrice per second. Which of the following frequency is the most likely the frequency of the 4^{th} string on his guitar ?

A. 130

B. 117

C. 110

D. 120

Answer: B

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2. A transverse wave moves from a medium A to a medium B. In medium A, the velocity of the transverse wave is 500 ms^{-1} and the wavelength is 5 m. The frequency and the wavelength of the wave in medium B when its velocity is $600ms^{-1}$, respectively are

A. 120 Hz and 5 m

B. 100 Hz and 5 m

C. 120 Hz and 6 m

D. 100 Hz and 6 m

Answer: D

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3. For a particular tube, among six harmonic frequencies below 1000 Hz, only four harmonic frequencies are given: 300 Hz, 600 Hz, 750 Hz and 900 Hz. What are the two other frequencies missing from this list?

A. 100 Hz, 150 Hz

B. 150 Hz, 450 Hz

C. 450 Hz, 700 Hz

D. 700 Hz, 800 Hz

Answer: B

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4. Compare the velocities of the wave forms given

where v_A, v_B, v_c and v_D are velocities given in (a),(b),(c) and (d), respectively.

A. $v_A > v_B > v_D > v_c$

B. $v_A < v_B < v_D < v_c$

C. $v_A = v_B = v_D = v_c$

D. $v_A < v_B = v_D < v_c$

Answer: C

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5. A sound wave whose frequency is 5000 Hz travels in air and then hits the water surface. The ratio of its wavelength in water and air is

A. 4.30

B. 0.23

C. 5.30

D. 1.23

Answer: A

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6. A person standing between two parallel hills fires a gun and hears the first echo after t_1 sec and the second echo after t_2 sec. The distance between the two hills is

A. $\frac{v(t_1 - t_2)}{2}$

B. $\frac{v(t_1 - t_2)}{2(t_2 + t_2)}$

C. $v(t_1 + t_2)$

D. $\frac{v(t_1 + t_2)}{2}$

Answer: D

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7. An air column in a pipe which is closed at one end, will be in response with the vibrating body of frequency 83 Hz. Then the length of the air column is

A. $1.5m$

B. $0.5m$

C. $1.0m$

D. $2.0m$

Answer: C

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8. The displacement y of a wave travelling in the x direction is given by $y = \left(2 \times 10^{-3}\right)\sin\left(300t - 2x + \frac{\pi}{4}\right)$, where x and y are measured in metres and t in second. The speed of the wave is

A. $150ms^{-1}$

B. $300ms^{-1}$

C. $450ms^{-1}$

D. $600ms^{-1}$

Answer: A

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9. Consider two uniform wires vibrating simultaneously in their fundamental notes. The tension, densities, lengths and diameter of the two wires are in the ratio 8:1, 1:2, x:y and 4:1 respectively. If the note of the higher pitch

has a frequency of 360 Hz and the number of beats produced per second is 10, then the value of x:y is

A. $36:35$

B. $35:36$

C. $1:1$

D. $1:2$

Answer: A

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10. Which of the following represents 1 amu ?

A. $(x - vt)^3$

B. $x(x + vt)$

C. $\frac{1}{(x + vt)}$

D. $\sin(x + vt)$

Answer: D

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11. A man sitting on a swing which is moving to an angle of 60° from the vertical is blowing a whistle is 2.0 m from the fixed support point of the whistle sound is kept in front of the swing. The maximum frequency the sound detechor detected is :

A. $2.027kHz$

B. $1.974kHz$

C. $9.74kHz$

D. $1.011kHz$

Answer: A

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12. Let $y = \frac{1}{1+x^2}$ at t=0 s be the amplitude of the wave propogating in the positive x-direction. At t=2 s, the amplitude of the wave propogating becomes $y = \frac{1}{1+(x-2)^2}$. Assume that the shape of the wave does not change during propogation. The velocity of the wave is

A. $0.5ms^{-1}$

B. $1.0ms^{-1}$

C. $1.5ms^{-1}$

D. $2.0ms^{-1}$

Answer: B

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13. A uniform rope having mass m hangs vertically from a rigid support. A tranverse wave pulse is produced at the lower end.

Which of the following plots shows the correct variation of speed v with height h from the lower end ?

A. 

B. 

C. 

D. 

Answer: D

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14. An organ pipe A closed at one ends is allowed to vibrate in its first harmonic and another pipe B open at both ends is allowed to vibrate in its third harmonic. Both A and B are in resonance with a given tuning fork. The ratio of the length of A and B is

A. $\frac{8}{3}$

B. $\frac{3}{8}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

Answer: D

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Answer: C

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C. $450ms^{-1}$

D. $600ms^{-1}$

Answer: A

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23. Consider two uniform wires vibrating simultaneously in their fundamental notes. The tension, densities, lengths and diameter of the two wires are in the ratio 8:1, 1:2, x:y and 4:1 respectively. If the note of the higher pitch has a frequency of 360 Hz and the number of beats produced per second is 10, then the value of x:y is

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C. $1:1$

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24. Which of the following represents a wave?

A. $(x-vt)^3$

B. $x(x+vt)$

C. $\frac{1}{(x+vt)}$

D. $\sin(x+vt)$

Answer: D

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25. A man sitting on a swing which is moving to an angle of 60° from the vertical is blowing a whistle which has frequency of 2.0 KHZ. The whistle is 2.0 m from the fixed support point of the swing. A sound detector which detects

the whistle sound is kept in front of the swing. The maximum frequency the sound detector detected is :

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C. $1.5ms^{-1}$

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A. 

B. 

C. 

D. 

Answer: D

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are in resonance with a given tuning fork. The ratio of the length of A and B is

A. $\frac{8}{3}$

B. $\frac{3}{8}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

Answer: D

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Evalution Textbook Questions And Answers Short Answers Questions

1. What is meant by waves?

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2. Write down the types of waves.

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3. What are transverse waves? Give one exmaple.

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4. What are longitudinal waves? Give one example.

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5. Define wavelength.

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6. Write down the relation between frequency, wavelength and velocity of a wave.

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7. What is meant by interference of waves?

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8. Explain the beat phenomenon.

Watch Video Solution

9. Define intensity of sound and loudness of sound.

Watch Video Solution

10. Explain Doppler effect.

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11. Explain red shift and blue shift in Doppler effect.

Watch Video Solution

12. What is meant by end correction in resonance air column apparatus?

Watch Video Solution

13. Sketch the function $y = x + a$. Explain your sketch.

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14. Write down the factors affecting velocity of sound in gases.

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Evalution Textbook Questions And Answers Long Answers Questions

1. Discuss how ripples are formed in still water.

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2. Briefly explain the difference between travelling waves and standing waves.

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3. Show that the velocity of travelling wave produced in a string is $v = \sqrt{\frac{T}{\mu}}$

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4. Describe Newton's formula for velocity of sound waves in air.

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5. Write short notes on reflection of sound waves from plane and curved surface.

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6. Briefly explain the concept of super position principle.

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7. Explain how the interference of waves is formed.

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8. Describe the formation of beats.

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9. What are stationary waves ? Explain the formation of stationary waves and also write down the characteristics of stationary waves.

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10. Discuss the laws of transverse vibration in stretched strings.

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11. Explain the concepts of fundamental frequency, harmonics and overtones in detail.

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12. What is sonometer ? Give its construction and working. Explain how to determine the frequency fo tuning fork using sonometer.

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13. Write short notes on intensity and loudness .

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14. Explain how overtones are produced in a,

(a) Closed organ pipe

(b) Open organ pipe

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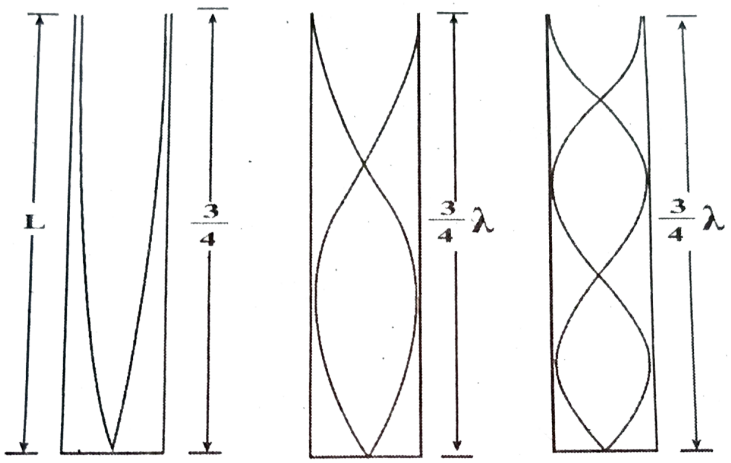
15. How will you determine the velocity of sound using resonance air column apparatus ?



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16. What is meant by Doppler effect ? Discuss the following case.

(i) Source in motion and Observer at rest

(a) Source moves towards observer

(b) Source moves away from the observer

(ii) Observer in motion and Source at rest.

(a)bserver moves towards Source

(b) Observer resides away from the Source

(iii) Both are in motion

(a) Source and Observer approach each other

(b) Source and Observer resides from each other

(c) Source chases Observer

(d) Observer chases Source

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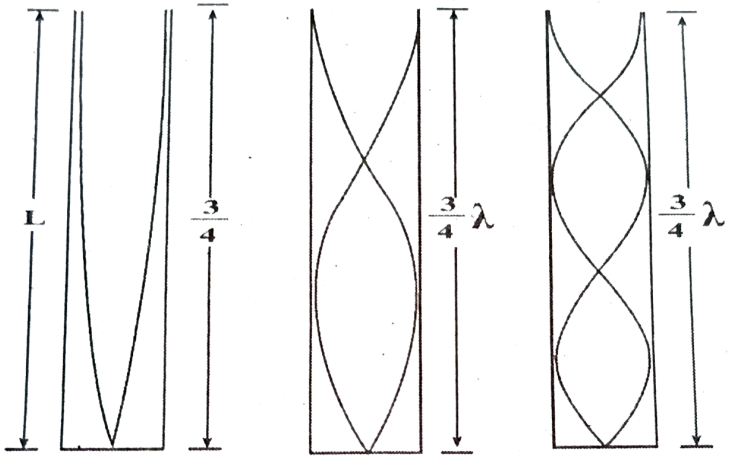

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Evalution Textbook Questions And Answers Numerical Problems

1. The speed of a wave in a certain medium is 900 m/s. If 3000 waves passes over a certain

point of the medium in 2 minutes, then compute its wavelength.

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2. Consider a mixture of 2 mole helium and 4 mole of oxygen. Compute the speed of sound in this gas mixture at 300 K.

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3. A ship in a sea sends SONAR waves straight down into the seawater from the bottom of the ship. The signal reflects from the deep bottom bed rock and returns to the ship after 3.5 s. After the ship moves to 100 Km it sends another signal which returns back after 2s. Calculate the depth of the sea in each case and also compute the difference in height between two cases.

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4. A sound wave is transmitted into a tube as shown in figure. The sound wave splits into two waves at the point A which recombine at point B. Let R be the radius of the semicircle which is varied until the first minimu. Calculate the radius of the semi-circle if the wavelenght of the sound is $50.0m$

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5. N tuning forks are arranged in order of increasing frequency and any two successive tuning forks give n beats per second when sounded together. If the last fork gives double the frequency of the first (called as octave), Show that the frequency of the first tuning fork is $f = (N-1)n$.

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6. Let the source propagate a sound waves whose intensity at a point (initially) be I. suppose we consider a case when the amplitude of the sound wave is doubled and the frequency is reduced to one-fourth. Calculate now the new intensity of sound at the same point ?

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7. Consider two organ pipes of same length in which are organ is closed and another organ pipe is open. If the fundamental frequency of closed pipe is 250 Hz. Calculate the fundamental frquency of the open pipe.

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8. A police in a siren car moving with a velocity $20ms^{-1}$ chases a thief who is moving in a car with a velocity v_0ms^{-1}.The police car sounds

at frequency 300 Hz, and both of them move towards a stationary siren of frequency 400 Hz. Calculate the speed in which thief is moving.

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9. Consider the following functon,

(a) $y = x^2 + 2\alpha, tx$

(b) $y = (x + vt)^2$

Which among the above function can be characterized as a wave ?

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Evalution Textbook Questions And Answers Conceptual Questions

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2. Why is the roar of our national animal different from the sound of a mosquito?

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3. A sound source and listener are both stationary and a strong wind is blowing. Is there a Doppler effect?

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4. In an empty room why is it that a tone sounds louder than in the room having things like furniture etc.

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5. How do animals sense impending danger of hurricane?

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Other Important Questions Answers Multiple Choice Quesntions

1. Select the correct pairs of factors on which does the velocity of sound in any gas depend.

A. density and elasticity of gas

B. wavelength of sound only

C. amplitude and frequency of sound

D. intensity of sound waves only

Answer: A

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2. Assertion : Sound wave cannot propagate through vacuum but light can.

Reason : Sound wave cannot be polarised but light can.

A. Both assertion and reason are true and reason is the correct explanation of the assertion

B. Both assertion and reason are true and reason is not the correct explanation of the assertion

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: B

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3. A 5.5 meter long string has a mass of $0.03.5kg$. If the tension in the string is 77 N, the speed of a wave on the string is :

A. $165ms^{-1}$

B. $102ms^{-1}$

C. $110ms^{-1}$

D. $77ms^{-1}$

Answer: C

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4. With propogation of longitudinal waves through a medium the quantity transmitted is

A. energy

B. energy and mass

C. energy and linear momentum

D. energy momentum and mass

Answer: A

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5. What is the wavelength of wave shown in given figure ?

A. $0.3m$

B. $0.08m$

C. $0.6m$

D. $4cm$

Answer: B

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6. Choose the odd man out from the following

:

A. Wavelength

B. Frequency

C. Phase

D. Acceleration

Answer: D

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7. The speed of a wave in medium is $760ms^{-1}$. If 3600 waves cross a point in the medium in 2 minutes, then the wavelength of the wave is :

A. $25.8m$

B. $14.75m$

C. $25.3M$

D. $50.6M$

Answer: C

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8. A uniform wire of length 20 m and weighing 5 kg hangs vertiacally . If $g = 10m/s^2$, then

the speed of transverse wave is the middle of the wire :

A. 4 m/s

B. $10\sqrt{2}m/s$

C. 0

D. $10m/s$

Answer: D

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9. Which of the following statements is correct ?

The waves in which the particles of the medium vibrate in direction perpendicular to the direction of wave motion, are known as :

A. longitudinal waves

B. propagated waves

C. transverse waves

D. none of these

Answer: C

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10. A wave of frequency 100 Hz s sent along a string towards a fixed unit. 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 (or reflected) waves are :

A. $10m/s$

B. $5m/s$

C. $40m/s$

D. $20m/s$

Answer: D

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11. Which one of the following is a correct pair to list the necessary properties of a medium for the propagation of wave ?

A. Elasticity and stress

B. Elasticity and inertia

C. Strain and inerita

D. Compressbility and buoyancy

Answer: B

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12. A transvrs wave propagating along x-axis is represented by

y(x,t) $= 80. . \sin\left(0.5\pi x - 4\pi t - \frac{\pi}{4}\right)$. Where x is in metress and t is seconds. The speed of the wave is :

A. $4im/s$

B. $\frac{\pi}{4}m/s$

C. $8m/s$

D. $0.5\pi m/s$

Answer: C

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13. Standing waves are formed on a string when interference occurse between two waves having :

A. The same amplitude travelling in the opposite direction between them

B. different amplitudes travelling in the same direction

C. different amplitudes travelling in the opposite direction

D. the same amplitude, travelling in the opposite direction with no phase difference between them.

Answer: D

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14. 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 is 120°. The resultant amplitude will be :

A. $2A$

B. $3A$

C. $\sqrt{2}A$

D. A

Answer: D

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15. When a stationary wave is formed, then its frequency is :

A. $\sqrt{2}$ that of the individual waves

B. half that of the individual waves

C. twice that of the individual waves

D. same as that of the individual waves.

Answer: D

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16. Assertion : When two tuning forks are vibrating with frequencies 256 Hz and 480 Hz are held near each other, beats cannot be heard.

Reason : The principle of super position is

valid if the frequencies of the oscillators are nearly equal.

A. Both assertion and reason are true and reason is the correct explanation of the assertion

B. Both assertion and reason are true and reason is not the correct explanation of the assertion

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: D

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17. Which one of the following statements is a correct statement

A. For constructive interference

$$I_{\text{maximum}} = (A_1 - A_2)^2$$

B. For constructive interference

$$I_{\text{minimum}} = (A_1 + A_2)^2$$

C. Velocity of transverse wave on string is

$$v = \sqrt{\frac{T}{\mu}} ms^{-1}$$

D. Velocity of transverse wave on string is

$$v = \sqrt{\frac{\rho}{E}} ms^{-1}$$

Answer: C

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18. Which one of the following statements is an incorrect statement ?

A. Sound intensity level is givenby $\Delta L = 10\frac{\log_{10}(I_1)}{I_0}$ decibel.

B. If natural frequencies are written as multiples of fundamental frequencies then they are said to be overtones.

C. In a closed organ odd harmonics are formed.

D. An open pipe odd and even harmonics are formed.

Answer: B

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19. An open organ pipe of length l vibrates with its fundamental note. The presure variation is maximum.

A. at the middle of the pipe

B. at the distance $\frac{\lambda}{4}$ inside the ends

C. at the distance $\frac{\lambda}{8}$ inside the ends

D. at the two ends

Answer: A

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20. The phase difference between two pointsw separated by 1 in a wave of frequency 120 Hz is 90°. The wave velocity will be :

A. $480m/s$

B. $180m/s$

C. $720m/s$

D. $240m/s$

Answer: A

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21. An organ pipe, open at both ends produces 5 beats per second. When vibrated with a source of frequency 200 Hz. The second harmonic of the same pipe produces 10 beats per second with a source of frequency 420 Hz. The frequency of source is :

A. 205 Hz

B. 210 Hz

C. 195 Hz

D. 190 Hz

Answer: A

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22. An open pipe is in resonance in 2^{nd} harmonic with the frequency f_1 . Now one end of the tube is closed and frequency is increased to f_2 such that the resonance again occurs in n^{th} harmonic. Choose the correct option.

A. $n = 3f_2 = \frac{5}{4}f_1$

B. $n = 5,\ f_2 = \frac{5}{4}f_1$

C. $n = 3,\ f_2 = \frac{3}{4}f_1$

D. $n = 5,\ f_2 = \frac{3}{4}f_1$

Answer: B

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23. Choose the correct pair of factors that are affecting speed of sound in gases.

A. Volume and pressure

B. Temperature and pressure

C. Temperature and density

D. Temperature and moisture

Answer: A

 Watch Video Solution

24. An organ pipe closed at one end is excited to support the third overtone. Which of the

following pairs are found that air in the pipe has :

A. 4 nodes and 4 antinodes

B. 4 nodes and 3 antinodes

C. 3 nodes and 4 antinodes

D. 3 nodes and 3 antinodes

Answer: A

Watch Video Solution

25. The frequency of vibrating air column in closed organ pipe is n. If it length be boubled and radius halved. Its frequency will be nearly :

A. $\frac{n}{2}$

B. $4n$

C. n

D. $2n$

Answer: A

Watch Video Solution

26. Select the correct pair stating has applications of reflection of sound waves.

A. SONAR and RADAR

B. SONAR and stethoscope

C. Ultrasonic waves and infrasonic waves

D. Echo and infrasonic waves

Answer: B

 Watch Video Solution

27. Which one of the following graphs indicate the variation 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. 

Answer: D

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28. Which one of the following statements is an icorrect statement ?

A. The phenomenon of beats is not observed in the case of visible light waves

B. The decreases in the speed of sound at high altitudes due to a fall in pressure.

C. Standing waves are characterised by nodes and antinodes.

D. Transverse waves are characterised by crests and troughs.

Answer: B

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

A. decreases

B. increases

C. become zero

D. remains constant

Answer: D

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30. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of the air column

that resonates in the fundamental mode, with a tunig for is 0.1, when this length is changed to 3.5m the same tuning fork resonates with the first overtone. Calculate the end correction :

A. $0.025m$

B. $0.024m$

C. $0.012m$

D. $0.05m$

Answer: A

Watch Video Solution

31. For production of beats the two sourcs must have

A. different frequencies and sam phase

B. different frequencies

C. different frequencies and same amplitude

D. different frequencies same amplitude and same phase.

Answer: B

Watch Video Solution

32. Two waves of length 50 cm and 51 cm produced 12 beas per second. The velocity of sound is :

A. 331 m/s

B. 360 m/s

C. 340 m/s

D. 306 m/s

Answer: D

Watch Video Solution

33. The phenomenon of beats can take place :

A. for sound waves olny

B. for transverse waves only

C. for longitudinal waves only

D. for both longitudinal and transverse waves

Answer: D

Watch Video Solution

34. Which of the following pairs of options are correct ?

According to laws of transverse vibtrations in stretched strings, the frequency of vibrating string varies.

A. inversely with vibrating length. And mass per unit length

B. inversely with vibrating length and squqare and square root of mass per unit length

C. directly with vibrating length and square root of mass per unit length

D. directly with vibrating length and inversely with tension

Answer: B

Watch Video Solution

35. Two vibrating tuning forks produce waves given by

$y_1 = 4\sin 500\pi t$ and $y_2 = 2\sin 506\pi t.$

Number of beats produced per minute is :

A. 180

B. 3

C. 630

D. 60

Answer: A

Watch Video Solution

36. Which of the following statements are correct ?

(i) Light waves can be polarised

(ii) Longitudinal waves cannot be polarised

(iii) Sound waves in gas can be polarised

(iv) Transverse waves in a string can be polarised

A. statement (i) and (iii) are correct

B. statement (ii) and (iii) are correct

C. statement (i), (iii) and (iv) are correct

D. statement (i), (ii) and (iv) are correct

Answer: D

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

A. $0.2m$

B. $0.1m$

C. $0.5m$

D. $0.4m$

Answer: B

Watch Video Solution

38. The apaarent frequency of a note is 200 Hz when a listener is with a velocity of $40ms^{-1}$ towards a stationary source. When he 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 in m/s is :

A. 330

B. 320

C. 340

D. 360

Answer: D

Watch Video Solution

39. The apaarent frequency in Doppler's effect does not depend upon :

A. speed of the source

B. speed of the observer

C. distance between observer and source

D. frequency of the source.

Answer: C

Watch Video Solution

40. The observer hears no beats. If the frequency of the horn of the car B is 504 Hz , the frequency of the horn of the car A will be :

A. $440.5Hz$

B. $298.2Hz$

C. $529.2Hz$

D. none of these

Answer: C

View Text Solution

41. In the classification of sound waves which one of the following statements is correct. The sound waves having frequencies between 20 Hz to 20 KHz are :

A. Ultrasonic waves

B. Infrasonic waves

C. Audible waves

D. Transverse waves

Answer: C

Watch Video Solution

42. A car sounding its horn at 480 Hz moves towards a high wall at a speed of 20 m/s, the frequency of the reflected sound heard by the man sitting in the car will be nearest to :

A. 510 Hz

B. 570 Hz

C. 480 Hz

D. 540 Hz

Answer: D

Watch Video Solution

43. Sound of freqeuncy 1000 Hz from a stationary source is reflectd form an object approaching the source is $30ms^{-1}$, back to a stationary observer located at the source. The speed of sound in a air is $330ms^{-1}$. The frequency of the sound heard by the observer is :

A. 1000 Hz

B. 1100 Hz

C. 1200 Hz

D. 1090 Hz

Answer: C

Watch Video Solution

44. Select the correct pairs of factors on which does the velocity of sound in any gas depend.

A. density and elasticity of gas

B. wavelength of sound only

C. amplitude and frequency of sound

D. intensity of sound waves only

Answer: A

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45. Assertion : Sound wave cannot propagate through vacuum but light can.

Reasion : Sound wave cannot be polarised but light can.

A. Both assertion and reason are true and reason is the correct explanation of the assertion

B. Both assertion and reason are true and reason is not the correct explanation of the assertion

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: B

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46. A 5.5 meter long string has a mass of $0.03.5kg$. If the tension in the string is 77 N, the speed of a wave on the string is :

A. $165ms^{-1}$

B. $102ms^{-1}$

C. $110ms^{-1}$

D. $77ms^{-1}$

Answer: C

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47. With propogation of longitudinal waves through a medium the quantity transmitted is

A. energy

B. energy and mass

C. energy and linear momentum

D. energy momentum and mass

Answer: A

Watch Video Solution

48. What is the wavelength of wave shown in given figure ?

A. $0.3m$

B. $0.08m$

C. $0.6m$

D. $4cm$

Answer: B

View Text Solution

49. Choose the odd man out from the following :

A. Wavelength

B. Frequency

C. Phase

D. Acceleration

Answer: D

Watch Video Solution

50. The speed of a wave in medium is $760ms^{-1}$. If 3600 waves cross a point in the medium in 2 minutes, then the wavelength of the wave is :

A. $25.8m$

B. $14.75m$

C. $25.3M$

D. $50.6M$

Answer: C

Watch Video Solution

51. A uniform wire of length 20 m and weighing 5 kg hangs vertiacally . If $g = 10m/s^2$, then the speed of transverse wave is the middle of the wire :

A. 4 m/s

B. $10\sqrt{2}m/s$

C. 0

D. $10m/s$

Answer: D

Watch Video Solution

52. Which of the following statements is correct ?

The waves in which the particles of the

medium vibrate in direction perpendicular to the direction of wave motion, are known as :

A. longitudinal waves

B. propagated waves

C. transverse waves

D. none of these

Answer: C

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53. A wave of frequency 100 Hz s sent along a string towards a fixed unit. 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 (or reflected) waves are :

A. $10m/s$

B. $5m/s$

C. $40m/s$

D. $20m/s$

Answer: D

Watch Video Solution

54. Which one of the following is a correct pair to list the necessary properties of a medium for the propagation of wave ?

A. Elasticity and stress

B. Elasticity and inertia

C. Strain and inerita

D. Compressbility and buoyancy

Answer: B

Watch Video Solution

55. A transvrs wave propagating along x-axis is represented by

y(x,t) $= 80. . \sin\left(0.5\pi x - 4\pi t - \frac{\pi}{4}\right)$. Where x is in metress and t is seconds. The speed of the wave is :

A. $4im/s$

B. $\frac{\pi}{4}m/s$

C. $8m/s$

D. $0.5\pi m/s$

Answer: C

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56. Standing waves are formed on a string when interference occurse between two waves having :

A. The same amplitude travelling in the opposite direction between them

B. different amplitudes travelling in the same direction

C. different amplitudes travelling in the opposite direction

D. the same amplitude, travelling in the opposite direction with no phase difference between them.

Answer: D

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57. 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 is 120°. The resultant amplitude will be :

A. $2A$

B. $3A$

C. $\sqrt{2}A$

D. A

Answer: D

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58. When a stationary wave is formed, then its frequency is :

A. $\sqrt{2}$ that of the individual waves

B. half that of the individual waves

C. twice that of the individual waves

D. same as that of the individual waves.

Answer: D

Watch Video Solution

59. Assertion : When two tuning forks are vibrating with frequencies 256 Hz and 480 Hz are held near each other, beats cannot be heard.

Reason : The principle of super position is

valid if the frequencies of the oscillators are nearly equal.

A. Both assertion and reason are true and reason is the correct explanation of the assertion

B. Both assertion and reason are true and reason is not the correct explanation of the assertion

C. Both assertion and reason are false

D. Assertion is true and reason is false

Answer: D

View Text Solution

60. Which one of the following statements is a correct statement

A. For constructive interference

$$I_{\text{maximum}} = (A_1 - A_2)^2$$

B. For destructive interference

$$I_{\text{minimum}} = (A_1 + A_2)^2$$

C. Velocity of transverse wave on string is

$$v = \sqrt{\frac{T}{\mu}} ms^{-1}$$

D. Velocity of transverse wave on string is

$$v = \sqrt{\frac{\rho}{E}} ms^{-1}$$

Answer: C

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61. Which one of the following statements is an incorrect statement ?

A. Sound intensity level is givenby $\Delta L = 10\frac{\log_{10}(I_1)}{I_0}$ decibel.

B. If natural frequencies are written as multiples of fundamental frequencies then they are said to be overtones.

C. In a closed organ odd harmonics are formed.

D. An open pipe odd and even harmonics are formed.

Answer: B

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

A. at the distance $\frac{\lambda}{2}$ inside the ends

B. at the distance $\frac{\lambda}{4}$ inside the ends

C. at the distance $\frac{\lambda}{8}$ inside the ends

D. at the two ends

Answer: A

Watch Video Solution

63. The phase difference between two pointsw separated by 1 in a wave of frequency 120 Hz is 90°. The wave velocity will be :

A. $480m/s$

B. $180m/s$

C. $720m/s$

D. $240m/s$

Answer: A

Watch Video Solution

64. An organ pipe, open at both ends produces 5 beats per second. When vibrated with a source of frequency 200 Hz. The second harmonic of the same pipe produces 10 beats per second with a source of frequency 420 Hz. The frequency of source is :

A. 205 Hz

B. 210 Hz

C. 195 Hz

D. 190 Hz

Answer: A

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

A. $n = 3f_2 = \frac{5}{4}f_1$

B. $n = 5,\ f_2 = \frac{5}{4} f_1$

C. $n = 3,\ f_2 = \frac{3}{4} f_1$

D. $n = 5,\ f_2 = \frac{3}{4} f_1$

Answer: B

Watch Video Solution

66. Choose the correct pair of factors that are affecting speed of sound in gases.

A. Volume and pressure

B. Temperature and pressure

C. Temperature and density

D. Temperature and moisture

Answer: A

Watch Video Solution

67. An organ pipe closed at one end is excited to support the third overtone. Which of the following pairs are found that air in the pipe has :

A. 4 nodes and 4 antinodes

B. 4 nodes and 3 antinodes

C. 3 nodes and 4 antinodes

D. 3 nodes and 3 antinodes

Answer: A

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68. The frequency of vibrating air column in closed organ pipe is n. If it length be boubled and radius halved. Its frequency will be nearly :

A. $\frac{n}{2}$

B. $4n$

C. n

D. $2n$

Answer: A

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69. Select the correct pair stating has applications of reflection of sound waves.

A. SONAR and RADAR

B. SONAR and stethoscope

C. Ultrasonic waves and infrasonic waves

D. Echo and infrasonic waves

Answer: B

 Watch Video Solution

70. Which one of the following graphs indicate the variation 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. 

Answer: D

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71. Which one of the following statements is an icorrect statement ?

A. The phenomenon of beats is not observed in the case of visible light waves

B. The decreases in the speed of sound at high altitudes due to a fall in pressure.

C. Standing waves are characterised by nodes and antinodes.

D. Transverse waves are characterised by crests and troughs.

Answer: B

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72. Two waves of the same frequency and intensity superimpose each other in opposite phases. After the superposition, the intensity and frequency of waves will :

A. decreases

B. increases

C. become zero

D. remains constant

Answer: D

View Text Solution

73. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of the air column

that resonates in the fundamental mode, with a tunig for is 0.1, when this length is changed to 3.5m the same tuning fork resonates with the first overtone. Calculate the end correction :

A. $0.025m$

B. $0.024m$

C. $0.012m$

D. $0.05m$

Answer: A

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74. For production of beats the two sources must have :

A. different frequencies and same phase

B. different frequencies

C. different frequencies and same amplitude

D. different frequencies same amplitude and same phase.

Answer: B

Watch Video Solution

75. Two waves of length 50 cm and 51 cm produced 12 beas per second. The velocity of sound is :

A. 331 m/s

B. 360 m/s

C. 340 m/s

D. 306 m/s

Answer: D

Watch Video Solution

76. The phenomenon of beats can take place :

A. for sound waves only

B. for transverse waves only

C. for longitudinal waves only

D. for both longitudinal and transverse waves

Answer: D

Watch Video Solution

77. Which of the following pairs of options are correct ?

According to laws of transverse vibtrations in stretched strings, the frequency of vibrating string varies.

A. Inversely with vibrating length and mass per unit length

B. Inversely with vibrating length and square root of mass per unit length

C. Directly with vibrating length and square root of mass per unit length

D. Directly with vibrating length and inversely with tension

Answer: B

Watch Video Solution

78. Two vibrating tuning forks produce waves given by

$y_1 = 4\sin 500\pi t$ and $y_2 = 2\sin 506\pi t.$

Number of beats produced per minute is :

A. 180

B. 3

C. 630

D. 60

Answer: A

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79. Which of the following statements are correct ?

(i) Light waves can be polarised

(ii) Longitudinal waves cannot be polarised

(iii) Sound waves in gas can be polarised

(iv) Transverse waves in a string can be polarised

A. statement (i) and (iii) are correct

B. statement (ii) and (iii) are correct

C. statement (i), (iii) and (iv) are correct

D. statement (i), (ii) and (iv) are correct

Answer: D

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

A. $0.2m$

B. $0.1m$

C. $0.5m$

D. $0.4m$

Answer: B

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81. The apaarent frequency of a note is 200 Hz when a listener is with a velocity of $40ms^{-1}$ towards a stationary source. When he 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 in m/s is :

A. 330

B. 320

C. 340

D. 360

Answer: D

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82. The apaarent frequency in Doppler's effect does not depend upon :

A. speed of the source

B. speed of the observer

C. distance between observer and source

D. frequency of the source.

Answer: C

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83. Two cars A and B approach a stationary observer from opposite sides with the speed of 15m/s and 30 m/s respectively.The observer hears no beats. If the frequency of the horn of the car B is 504 Hz , the frequency of the horn of the car A will be :

A. $440.5Hz$

B. $298.2Hz$

C. $529.2Hz$

D. none of these

Answer: C

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84. In the classification of sound waves which one of the following statements is correct. The sound waves having frequencies between 20 Hz to 20 KHz are :

A. Ultrasonic waves

B. Infrasonic waves

C. Audible waves

D. Transverse waves

Answer: C

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85. A car sounding its horn at 480 Hz moves towards a high wall at a speed of 20 m/s, the frequency of the reflected sound heard by the man sitting in the car will be nearest to :

A. 510 Hz

B. 570 Hz

C. 480 Hz

D. 540 Hz

Answer: D

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86. Sound of freqeuncy 1000 Hz from a stationary source is reflectd form an object approaching the source is $30ms^{-1}$, back to a stationary observer located at the source. The

speed of sound in a air is $330ms^{-1}$. The frequency of the sound heard by the observer is :

A. 1000 Hz

B. 1100 Hz

C. 1200 Hz

D. 1090 Hz

Answer: C

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Other Important Questions Answers Very Short Answer Questions

1. Which type of waves do not require a material medium for their propagation ?

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2. In which type of media longitudinal waves can be transmitted ?

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3. Which type of elesticity a medium must posses for transverse wave motion to be possible ?

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4. What is the difference between wave velocity and particle velocity ?

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5. Does a vibrating body always produce sound ?

Watch Video Solution

6. What is the phase difference between the particles being on either side of a node ?

Watch Video Solution

7. Two sound waves produce 12 beats in 4 second. By how much do their frequencies differ ?

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8. What is an echo ?

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9. What is progressive wave ?

Watch Video Solution

10. List the condition for the constructive interference to take place.

Watch Video Solution

11. List the condition for the destructive interference to take place.

Watch Video Solution

12. What is the essential condition for the formation of beats ?

Watch Video Solution

13. Distinguish between tone and a note.

Watch Video Solution

14. What are harmonics ?

Watch Video Solution

15. What are overtones ?

 Watch Video Solution

16. Define inverse square law of sound intensity.

 Watch Video Solution

17. What is the relation between loudness and intensity ?

Watch Video Solution

18. What is meant by threshold of hearing ?

Watch Video Solution

19. The wave which do not require medium for their propagation are known as

Watch Video Solution

20. In which type of media longitudinal waves can be transmitted ?

Watch Video Solution

21. Which type of elesticity a medium must posses for transverse wave motion to be possible ?

Watch Video Solution

22. What is the difference between velocity and average velocity?

Watch Video Solution

23. Does a vibrating body always produce sound ?

Watch Video Solution

24. What is the phase difference between particles being on either side of a node?

Watch Video Solution

25. Two sound waves produce 12 beats in 4 second. By how much do their frequencies differ ?

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Watch Video Solution

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Watch Video Solution

35. Derive the relation between Intensity and loudness.

Watch Video Solution

36. What is meant by threshold of hearing ?

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Other Important Questions Answers Short Answer Questions

1. Is an oscillation a wave ? Give reason.

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2. What will be the velocity of sound in a perfectly rigid rod ? Given reason.

Watch Video Solution

3. What do you understand by the term Reverberation ?

Watch Video Solution

4. State principle of superposition.

Watch Video Solution

5. Name the three concept that principle superposition of waves can explain.

Watch Video Solution

6. What is the necessary condition for the formation of stationary waves ?

Watch Video Solution

7. When a stationary wave is produced ?

Watch Video Solution

8. Two sound of very close frequencies say 256 Hz and 260 Hz are produced simultaneously. What isw the frequency of resultant sound and also write the number of beats heard in one second ?

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9. Define amplitude of the wave.

Watch Video Solution

10. On what factors velocity of transverse wave in a string depends ?

Watch Video Solution

11. Define angular frequency, wave number and wave vector.

Watch Video Solution

12. Write the relation for velocity of longitudinal waves in,

(i) One dimensional rod

(ii) Three dimensional rod

(iii) Liquid medium

Watch Video Solution

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

R : In Sound , change in frequency depends on the individual velocity of both the source as

well as the observer . In light , change in frequency depends on the relative velocity between source and observer .

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14. State the laws of reflection.

Watch Video Solution

15. What do you understand by the word speculaar reflection ?

Watch Video Solution

16. Draw the diagram to depict reflection of sound (a) plane surface, (b) convex surface and (c) concave surface.

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17. Define wave vector and reciprocal vectors also write the relationship between velocity and reciprocal vectors.

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18. Is an oscillation a wave ? Give reason.

Watch Video Solution

19. What will be the velocity of sound in a perfectly rigid rod ? Given reason.

Watch Video Solution

20. What do you understand by the term Reverberation ?

Watch Video Solution

21. State principle of superposition.

Watch Video Solution

22. Name the three effect (applications) of superpositin of waves.

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23. What is the necessary condition for the formation of stationary waves ?

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24. When are stationary waves produced?

Watch Video Solution

25. Two sound of very close frequencies say 256 Hz and 260 Hz are produced simultaneously. What isw the frequency of resultant sound and also write the number of beats heard in one second ?

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Watch Video Solution

29. Write the relation for velocity of longitudinal waves in,

(i) One dimensional rod

(ii) Three dimensional rod

(iii) Liquid medium

Watch Video Solution

30. Doppler effect in sound is called asymmetric, Explain.

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31. State the laws of reflection.

Watch Video Solution

32. What do you understand by the word speculaar reflection ?

Watch Video Solution

33. Draw the diagram to depict reflection of sound (a) plane surface, (b) convex surface and (c) concave surface.

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Other Important Questions Answers Long Answer Questions

1. What is the effect of pressure on velocity of sound in gas?

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2. Prove that speed of sound in air increases by $0.61ms^{-1}$ per degree celsius rise in temperature.

Watch Video Solution

3. What are the factors that effect the speed of sound in gases?

Watch Video Solution

4. Prove that $V = \sqrt{\gamma CT}$ from the ideal gas equation for speed of sound is gases.

Watch Video Solution

5. Write note on stethoscope.

Watch Video Solution

6. What are the important characteristics of progressive wave?

Watch Video Solution

7. Explain graphically the formation of superposition when two pulses travelling

towards each other ?

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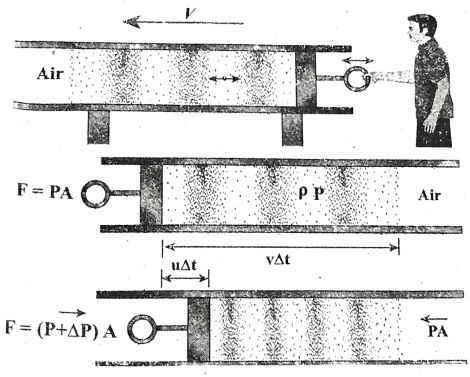
8. Describe an experiment to explain the phenomenon of interferece of waves ?

View Text Solution

9. Show that velocity of longitudinal waves is $v = \sqrt{\frac{E}{\rho}}$



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10. Discuss the effect of (i) Density (ii) humidity on the velocity of sound in gases?

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11. Write note on graphical representation of wave

(i) Space variation graph

(ii) Space variation graph :

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12. Obtain an expression for a stationary wave formed by two sinusoidal waves travelling along the same path in opposite direction,

also discuss the condition for the formation of Nodes and Anti-nodes?

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13. Prove that $\Delta L = 10 \log_{10}\left[\frac{I_1}{I_0}\right]$ decibel, from Weber-Fechner's law.

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14. What is the effect of pressure on velocity of sound in gas?

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Watch Video Solution

19. What are the important characteristics of progressive wave?

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20. Explain graphically the formation of superposition when two pulses travelling towards each other ?

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21. Describe an experiment to explain the phenomenon of interferece of waves ?

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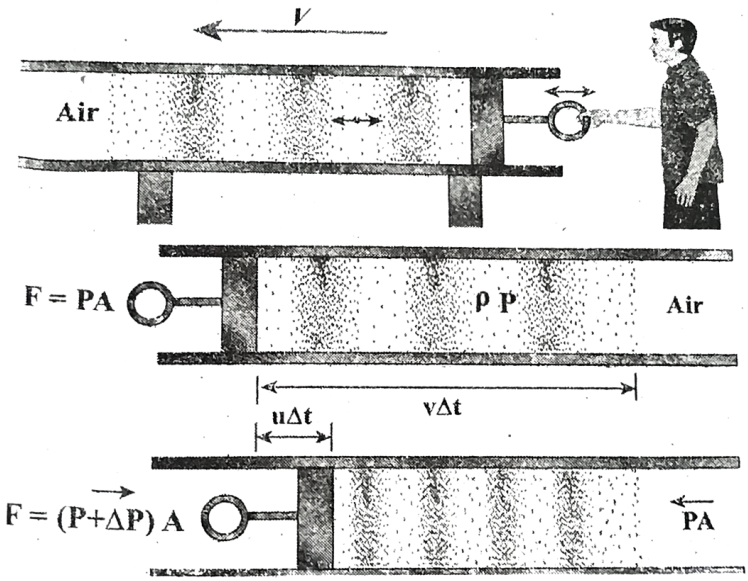
22. Show that velocity of longitudinal waves is $v = \sqrt{\frac{E}{\rho}}$



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23. Discuss the effect of (i) Density (ii) humidity on the velocity of sound in gases?

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24. Write note on graphical representation of wave

(i) Space variation graph

(ii) Space variation graph :

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25. Obtain an expression for a stationary wave formed by two sinusoidal waves travelling along the same path in opposite direction,

also discuss the condition for the formation of Nodes and Anti-nodes?

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26. Prove that $\Delta L = 10 \log_{10}\left[\frac{I_1}{I_0}\right]$ decibel, from Weber-Fechner's law.

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Other Important Questions Answers Numerical Problems

1. The equation of a wave is,

$$y(x,t) = 0.05 \sin\left[\frac{\pi}{2}(10x - 40t) - \frac{\pi}{4}\right] m$$

Find,

The wavelength, the frequency and the wave velocity.

(ii) The particle velocity and acceleration at x=0.5 m and t=0.05 s.

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2. The equation of a plane progressive wave is $y = 10 \sin 2\pi(t - 0.05x)$. Where y and x are in

an and t in seconds. Calculate the amplitude, frequency, wavelength and velocity of the wave.

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3. Calculate the change in intensity level when the intensity of sound increases by 10^6 times its original intensity.

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4. Audible frequencies have a range 20 Hz to 20,000 Hz. Express this range in terms of

(i) Period T.

(ii) Wavelength λ in air.

(iii) Angular frequency. Given velocity of sound in air is $330ms^{-1}$.

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5. In a sonometer experiment, the density of the material of the wire used is

$7.5 \times 10^3 kgm^{-3}$. If the stress of the wire is $3.0 \times 10^8 Nm^{-2}$, find out the speed of the transverse wave in the wire.

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6. For aluminium the bulk modulus and modulus of rigidity are $7.5 \times 10^{10} Nm^{-2}$ and $2.1 \times 10^{10} Nm^{-2}$. Find the velocity of longitudinal waves in the medium. Density of aluminium is $2.7 \times 10^3 kgm^{-3}$.

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7. An open pipe is suddenly closed at one end with the result that the frequency of the third harmonic of the closed pipe is found to be higher by 100 Hz than the fundamental frequency of the open pipe. What is the fundamental frequency of the open pipe?

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8. A resonance tube is resonated with tuning fork of frequency 512 Hz. Two successive lengths of the resonated air-column are 16.0 cm and 51.0 cm. The experiment is performed at the room temperature of $40^{\circ}C$ calculate the speed of sound at $0^{\circ}C$and the end correction.

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9. The fundamental frequency of a closed organ pipe is equal to the first overtone of an open organ pipe. If the length of the open pipe is 60 cm, What is the length of the closed pipe?

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10. A source and observer are approaching one another with the relative velocity $40ms^{-1}$. If the true source frequency is 1200 Hz, deduce

the observed frequency under the following conditions:

(i) All velocity is in the source alone.

(ii) All velocity is in the observer alone.

(iii) The source moves in air at $100ms^{-1}$ towards the observer, but the observed also moves with the velocity v_0 in the same direction. (Velocity of sound 340 m/s)

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11. An observer moves towards a stationary source of sound with a velocity one-fifth of the velocity of sound. Calculate the percentage increase in the apparent frequency?

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12. A rocket is moving at a speed of 200m/s towards a stationary target. While moving, it emits a wave of frequency 1000Hz. Calculate

the frequency of the sound as detected by the target. (Velocity of sound in air is 330m/s)

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13. If the pitch of the sound of a source appears to drop by 10% to a moving person, then determine the velocity of motion of the person. Velocity of the sound $= 330ms^{-1}$.

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14. A whistle of frequency 540 Hz rotates in a circle of radius 2 m at an angular speed of $15 rads^{-1}$. What is the lowest and highest frequency heard by a listener a long distance away at rest with respect to centre of the circle ? Can the apparent frequecny be ever equal to the actual frequency? Take $V = 330 ms^{-1}$.

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15. An open pipe makes a good musical instrument, in comparison to a closed pipe. Why?

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16. Why is it that transverse waves cannot be produced in a gas? Can the transverse waves be produced in solids and liquids?

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17. Two astronauts on the surface of the moon cannot talk to each other why?

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18. Sound travels faster on a rainy day than on a dry day. Why?

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19. All harmonics are overtones but all overtones are not harmonics. How?

Watch Video Solution

20. Why does a tuning fork have two prongs?

Watch Video Solution

21. Where will a person hear maximum sound, at node or anti-node?

Watch Video Solution

22. What do mechanical wave transfer: energy, matter, both or neither?

Watch Video Solution

23. What will be the speed of sound in a perfectly rigid rod?

Watch Video Solution

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35. An observer moves towards a stationary source of sound with a velocity one-fifth of the velocity of sound. Calculate the percentage increase in the apparent frequency?

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36. A rocket is moving at a speed of 200 m s^{-1} towards a stationary target. While moving, it emits a wave of frequency 1000 Hz. Some of the sound reaching the target gets reflected back to the rocket as an echo. Calculate (1) the

frequency of the sound as detected by the target and (2) the frequency of the echo as detected by the rocket.

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37. If the pitch of the sound of a source appears to drop by 10% to a moving person, then determine the velocity of motion of the person. Velocity of the sound $= 330ms^{-1}$.

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