PHYSICS

BOOKS - MBD

WAVES

Example

1. A wave transmits energy. Can it transmit momentum?

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2. What is the relation between path difference and phase difference?

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3. Which property of the medium enables the transverse waves to pass through it?

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4. What is the relation between frequency, wavelength and wave velocity ?

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5. What are pressure waves?

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6. Is it possible to have longitudinal waves on: a string and on a transverse wave in a steel rod?

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7. Which waves do not require medium for propagation?

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8. Can mechanical waves travel through vacuum?

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9. A wave transmits momentum. Can it transfer angular momentum?

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10. What are the two main properties a material must posses for the propagation of waves through it.

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

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12. When a stone is thrown on the surface of water, a wave travel out. From where does the energy came?

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13. Sound can be heard over a long distance on a rainy day. Why?

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14. What is the common property with all types of mechanical waves?

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15. Sound wave from a point source are propagating in all directions. What will be ratio of amplitudes at distances of 9 m and 25 m from the source?

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16. The ratio of amplitude of two waves is 2:3. What is the ratio of intensities of these waves?

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17. In which medium - solid , liquid or gas, do the sound waves travel fastest?

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18. Represent a harmonic wave in terms of wevelength and time period.

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19. What is the distance between the two points which have a phase difference of 2π?

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20. A flute has several holes in it. Why?

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21. What is the distance between a node and an adjoining antinode in a stationary wave?

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22. Is it possible to have interference between the waves produced by two violins? Why?

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23. Will sound be louder at node or antinode in a stationary wave?

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24. When are the tones called harmonics?

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25. Sound is produced by vibratory motion, explain why then a vibrating pendulum does not produce sound?

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26. What is the difference between a tone and a note?

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27. Why stationary wave is so called?

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28. What are electromagnetic waves?

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29. What is the physical change occurs when the source of sound is stationary but the observer moves?

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30. What physical change occurs when source of sound moves and observer is stationary?

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31. If you set your watch by the sound of a distant siren, will it go fast or slow?

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32. Can you notice Doppler effect, if both the observer(or listener) and the source of sound are moving with same velocity in the same direction.

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33. A person riding on a merry go round emits a sound wave of certain frequency. Will the person at the centre observe Doppler effect.

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34. What is the limitation of Doppler's effect?

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35. A string of mass 2.50 kg is under a tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end?

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36. A stone dropped from the top of a tower of height 300 m high splashes into the water of a pond near the base of the tower. When is the splash heard at the top given that the speed of sound in air is 340 m s^{-1} ? (g = 9.8 m s^-2)

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37. A steel wire has a length of 12.0 m and a mass of 2.10 kg. What should be the tension in the wire so thatspeed of a transverse wave on the wire equalsthe speed of sound in dry air at $20^{\circ} C$= $343 ms^{-1}$.

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38. Use the formula v =$\sqrt{\frac{\gamma P}{P}}$to explain why the speed of sound in air: is independent of pressure.

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39. Use the formula v =$\sqrt{\frac{\gamma P}{P}}$to explain why the speed of sound in air: increases with temperature.

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40. Use the formula v $=\sqrt{\frac{\gamma P}{P}}$ to explain why the speed of sound in air: increases with humidity.

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41. You have learnt that a travelling wave in one dimension isrepresented by a function y = f (x, t) where x and t must appear in the combination x-vt or x + vt, i.e. y = f $(x \pm vt)$. Is the converse true? Examine if the following functions for y can possibly represent a travelling wave : $1/(x+vt)$

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44. A bat emits ultrasonic sound of frequency 1000 kHz in air. If the sound meets a water surface, what isthe wavelength of the reflected sound the reflected sound.

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45. A bat emits ultrasonic sound of frequency 1000 kHz in air. If the sound meets a water surface, what is the wavelength of the transmitted sound? Speed of sound in air is 340 $ms^{-1}$and in water 1486 ms^{-1}.

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46. A hospital uses an ultrasonic scanner to locate tumours in a tissue. What is the wavelength of sound in the tissue in which the speed of sound is $1.7 kms^{-1}$? The operating frequency of the scanner is 4.2 MHz.

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47. A transverse harmonic wave on a string is described by y(x. t) = 3.0 sin (36 t + 0.018 x + $(\pi/4)$) where x and y are in cm and tin s. The positive direction of x is from left to right. Is this a travelling wave or a stationary wave ? If it is travelling, what are the speed and direction of its propagation ?

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48. A transverse harmonic wave on a string is described by y(x. t) = 3.0 sin (36 t + 0.018 x + $(\pi/4)$) where x and y are in cm and tin s. The positive direction of x is from left to right. What are its amplitude and frequency ?

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49. A transverse harmonic wave on a string is described by y(x. t) = 3.0 sin (36 t + 0.018 x + $(\pi/4)$) where x and y are in cm and tin s. The positive direction of x is from left to right. What is the initial phase at the origin ?

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50. A transverse harmonic wave on a string is described by y(x. t) = 3.0 sin (36 t + 0.018 x + $(\pi/4)$) where x and y are in cm and tin s. The positive direction of x is from left to right. What is the least distance between two successive crests in the wave ?

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51. For the wave described in the above question, plot the displacement (y) versus time (t) graphs for x=0.2 and 4 cm. What are the shapes of

these graph? In which aspects does the oscillatory motion in a travelling wave differ from one point to another: amplitude,frequency or phase?

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52. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of 4m.

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53. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of 0.5 m.

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55. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of $(3\gamma)/4$.

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56. The transvers displacement of a string (clamped at its both ends) is given by y(x,t) = 0.06 sin ((2pi)/(3)s) cos (120 pit) Where x and y are in m and t in s. The length of the string 1.5 m and its mass is 3.0 xx 10^(-2) kg. Does the function represent a travelling wave or a stationary wave ?

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58. The transverse displacement of a string (clamped at its both ends) is given by y(x,t)=0.06 sin $\left(\left(2\frac{\pi}{3}\right)x\right)\cos(120\text{pit})wherex$ and $yare \in m$ and $t \in s.The \leq n > hofthestr \in gis1.5m$ and 3.0 xx10^-2 kg`. Determine the tension in the string

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59. For the wave described in the above question, plot the displacement (y) versus time (t) graphs for x=0.2 and 4 cm. What are the shapes of these graph? In which aspects does the oscillatory motion in a travelling wave differ from one point to another: amplitude,frequency or phase?

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60. What is the amplitude of a point 0.375 m away from one end?

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61. Given below are some functions of xand t to represent the displacement (transverse or longitudinal) of an elastic wave. State which of these represent (i) a travelling wave, (ii) a stationary wave or (iii) none at all: y = 2cos (3x)sin(10t)

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62. Given below are some functions of xand t to represent the displacement (transverse or longitudinal) of an elastic wave. State which of these represent (i) a travelling wave, (ii) a stationary wave or (iii) none at all: y = $2\sqrt{x - vt}$.

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63. Given below are some functions of xand t to represent the displacement (transverse or longitudinal) of an elastic wave. State which of these represent (i) a travelling wave, (ii) a stationary wave or (iii) none at all: y = 3 sin (5x-0.5t)+4cos(5x-0.5t)

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64. Given below are some functions of xand t to represent the displacement (transverse or longitudinal) of an elastic wave. State which of these represent (i) a travelling wave, (ii) a stationary wave or (iii) none at all: y = cos x sin t+cos 2x sin 2t.

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65. A wire stretched between two rigid supports vibrates in itsfundamental mode with a frequency of 45 Hz. The mass of the wire is 3.5×10^{-2} kg and itslinear mass density is $4.0 \times 10^{-2} kgm^{-1}$. What is the speed of a transverse wave on the string

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67. A metre-long tube open at one end, with a movable piston at the other end, shows resonance with a fixed frequency source (a tuning fork

of frequency 340 Hz) when the tube length is 25.5 cm or 79.3 cm. Estimate the speed of sound in air at the temperature of the experiment. The edge effects may be neglected.

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68. A steel rod 100 cm long is clamped at its middle. The fundamental frequency of longitudinal vibrations of the rod are given to be 2.53 kHz. What is the speed of sound in steel?

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69. A pipe 20 cm long is closed at one end. Which harmonic mode of the pipe is resonantly excited by a 430 Hz source ? Will the same source be in resonance with the pipe if both ends are open? (speed of sound in air is $1340ms^{-1}$)

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70. Two sitarstrings A and B playing the note 'Ga' are slightly out of tune and produce beats of frequency 6 Hz. The tension in the string A is slightly reduced and the beat frequency isfound to reduce to 3 Hz. If the original frequency of A is 324 Hz, what is the frequency of B?

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71. Explain why (or how): In a sound wave, a displacement node is a pressure antinode and vice versa,

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72. Explain why (or how): Bats can ascertain distances, directions, nature, and sizes of the obstacles without any "eyes",

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73. Explain why (or how): A violin note and sitar note may have the same frequency, yet we can distinguish between the two notes,

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74. Explain why (or how): Solids can support both longitudinal and transverse waves, but only longitudinal waves can propagate in gases.

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75. Explain why (or how)

the shape of a pulse gets distored during propagation in a dispersive medium.

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76. .A train,standing at the outersignal of a railway station blows a whistle of frequency 400 Hz in still air. What is the frequency and speed of sound in each case ? (a) approaches the platform with a speed of 10ms^(-1) , (b) receeds from the platform with a speed of 10ms^(-1)? (ii) The speed of sound in still air can be taken as 340ms^(-1)

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79. A train, standing in a station-yard, blows a whistle of frequency 400 Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of $10ms^{-1}$. What are the frequency, wavelength, and speed of sound for an observer standing on the station's platform? Is the situation exactly identical to the case when the air is still and the observer runstowards the yard at a speed of $10ms^{-1}$? The speed of sound in still air can be taken as $340ms^{-1}$.

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80. A travelling harmonic wave on a string is described by , $y = 7.5\sin(0.0050x + 12t + \pi/4)$

What are the displacement and velocity of oscillation of a point at x=1 cm and t=1 s ? Is this velocity equal to the velocity of wave propagation?

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81. A travelling harmonic wave on a string is described by ,

$y = 7.5\sin(0.0050x + 12t + \pi/4)$

Locate the points of the string which have the same transverse displacements and velocity as the x=1 cm points at t=2s,5s,11s.

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82. A narrow sound pulse (for example,a short pipe by a whistle) is sent across a medium

Does the pulse have a definite (i) frequency,(ii)wavelength,(iii)speed of propagation?

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83. A narrow sound pulse (for example,a short pipe by a whistle) is sent across a medium

If the pulse rate is 1 after every 20 s, (i.e. The whistle is blown for a split second after every 20 s),is the frequency of the note produced by the whistle equal to $\frac{1}{20} = 0.05Hz$?

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84. One end of a long string of linear mass density 8.0×10^{-3} kg m^{-1} is connected to an electrically driven tuning fork of frequency 256 Hz. The other end passes over a pulley and is tied to a pan containing a mass of 90 kg. The pulley end absorbs all the incoming energy so that reflected waves at this end have negligible amplitude. At t= 0, the left end (fork end) of the string x = 0 has zero transverse displacement (y = 0) and is moving along positive y-direction. The amplitude of the wave is 5.0 cm. Write down the transverse displacement y asfunction of x and tthat describes the wave on the string

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85. A SONAR system fixed in a submarine operates at a frequency 40.0 kHz. An enemy submarine moves towards the SONAR with a speed of $360 kmh^{-1}$.What is the frequency of sound reflected by the submarine? Take the speed of sound in water to be $1450 ms^{-1}$.

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86. Earthquakes generate sound waves inside the earth. Unlike a gas, the earth can experience both transverse (S) and longitudinal (P) sound waves. Typically the speed of S wave is about $4.0 kms^{-1}$ and that of P wave is $8.0 kms^{-1}$A seismograph records Pand Swavesfrom an earthquake. The first Pwave arrives 4 min before the first S wave. Assuming the waves travel in straight line, at what distance does the earthquake occur ?

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87. A bat is flitting about in a cave, navigating via ultrasonic beeps. Assume that the sound emission frequency of the bat is 40 khz. During one fast swoop directly toward a flat wall surface, the bat is moving at 0.03 timesthe speed of sound in air. What frequency does the bat hear reflected off the wall ?

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88. What waves produced by a motor boat sailing in water are:

A. neither longitudinal nor transverse

B. both longitudinal and transverse

C. only longitudinal

D. only transverse.

Answer:

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89. Sound waves of wavelength λ travelling in a medium with a speed of v m/s enter into another medium where its speed is 2v m/s.Wavelength of sound waves in the second medium is:

A. λ

B. $\frac{\lambda}{2}$

C. 2λ

D. 4λ

Answer:

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90. Speed of sound wave in air

A. is independent of temperature

B. increases with pressure

C. increases with increase in humidity

D. decreases with increase in humidity.

Answer:

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91. Change in temperature of the medium changes

A. frequency of sound waves

B. amplitude of sound waves

C. wavelength of sound waves

D. loudness of sound waves.

Answer:

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92. With propagation of longitudinal waves through a medium,the quantity transmitted is:

A. matter

B. energy

C. energy and matter

D. energy,matter and momentum.

Answer:

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93. Which of the following statements are true for wave motion?

A. Mechinical transverse waves can propogate through all mediums.

B. Longitudinal waves can propagate through solids only

C. Mechanical transverse waves can propagate through solids only

D. Longitudinal waves can propagate through vacuum.

Answer:

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94. A sound wave is passing through air column in the form of compression and rarefaction.In consecutive compresssions and rarefaction.In consecutive compressions and rarefactions.

A. density remains constant

B. Boyle's law is obeyed

C. bulk modulus of air oscillates

D. there is no transfer of heat.

Answer:

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95. Equation of a plane progressive wave is given by $y = 0.6 \sin 2\pi\left(t - \frac{x}{2}\right)$.On reflection from a denser medium its amplitude becomes 2/3 of the ampliude of the incident wave. The equation of the reflected wave is:

A. $y = 0.6 \sin 2\pi\left(t + \frac{x}{2}\right)$

B. $y = -0.4 \sin 2\pi\left(t + \frac{x}{2}\right)$

C. $y = 0.4 \sin 2\pi\left(t + \frac{x}{2}\right)$

D. $y = -0.4 \sin 2\pi\left(t - \frac{x}{2}\right)$

Answer:

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96. A string of mass 2.50 kg is under a tension of 200 N. The length of the stretched string is 20.0 m. If the transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end?

A. one second

B. 0.5 second

C. 2 second

D. data given is insufficient.

Answer:

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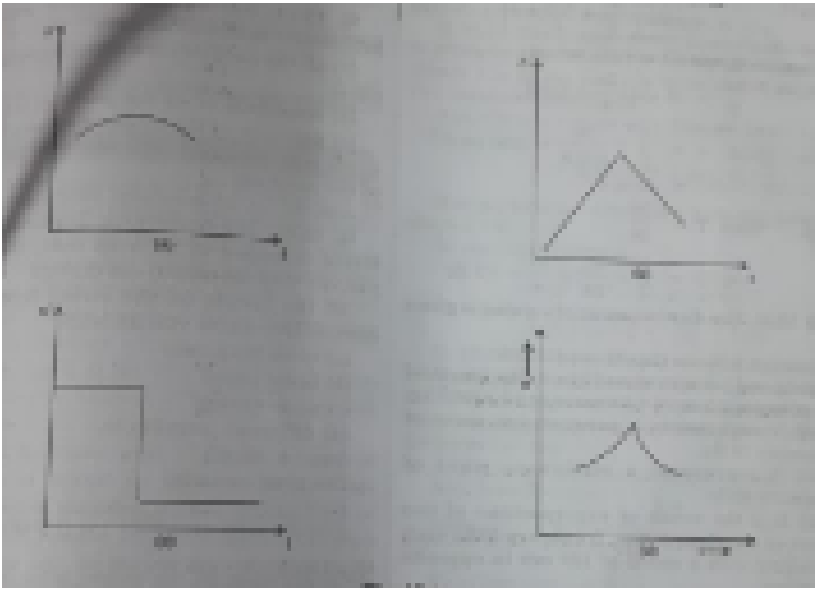
97. A train whistling at constant frequency is moving towards a station at a constant speed V. The train goes past a stationary observer on the station. The frequency n' of the sound as heard by the observer is plotted

as a function of time t (shown in the figure). Identical the expected curve.



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98. A transverse harmonic wave on a string is described by y(x. t) = 3.0 sin (36 t + 0.018 x + $(\pi/4)$) where x and y are in cm and tin s. The positive direction of x is from left to right. Is this a travelling wave or a stationary wave ? If it is travelling, what are the speed and direction of its propagation ?

A. The wave is travelling from right to left

B. The speed of the wave is 20m/s

C. Frequency of the wave is 5.7 Hz.

D. The least distance between two successive crests in the wave is 2.5 cm.

Answer:

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99. The transverse displacement of a string (clamped at its both ends) is given by y(x,t)=0.06 sin $\left(\left(2\frac{\pi}{3}\right)x\right)\cos($120pit $)wherex$ and $yare \in m$ and $t \in s. The \leq n > hofthestr \in gis1.5m$ and 3.0 xx10^-2 kg`. Determine the tension in the string

A. It represents a progressive wave of frequency 60 Hz.

B. It represents a stationary wave of frequency 60 Hz.

C. It is the result of superposition of two waves of wavelength 3m,frequency 60Hz each travelling with a speed of 180 m/s in

opposite direction.

D. Amplitude of this wave is constant.

Answer:

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100. Speed of sound waves in a fluid depends upon

A. directly on density of the medium

B. square of bulk modulus of the medium

C. inversely on the square root of density

D. directly on the square root of bulk modolus of the medium.

Answer:

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101. During propagation of a plane progressive mechanical wave

A. all the particles are vibrating in the same phase

B. amplitude of the particles is equal

C. particles of the medium excutes S.H.M.

D. wave velocity depends upon the nature of the medium.

Answer:

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102. The transverse displacement of a string (clamped at its both ends) is given by $y(x, t) = 0.06 \sin(2\pi x / 3)\cos(120\pi t)$.

All the points on the string between two consecutive nodes vibrate with

A. same frequency

B. same phase

C. same energy

D. different amplitude.

Answer:

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103. A train, standing in a station-yard, blows a whistle of frequency 400 Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of $10ms^{-1}$. What are the frequency, wavelength, and speed of sound for an observer standing on the station's platform? Is the situation exactly identical to the case when the air is still and the observer runstowards the yard at a speed of $10ms^{-1}$? The speed of sound in still air can be taken as $340ms^{-1}$.

A. the frequency of sound as heard by an observer standing on the platform is 400 Hz

B. the speed of sound for the observer standing on the platform is 350m/s

C. the frequency of sound as heard by the observer standing on the platform will increase

D. the frequency of sound as heard by the observer standing on the platform will decrease.

Answer:

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104. Which of the following statements are true for a stationary wave?

A. Every particle has a fixed amplitude which is different from the amplitude of its nearest particle.

B. All the particles cross their mean position at the same time

C. All the particles are oscillating with same amplitude

D. There is no net transfer of energy across any plane.

Answer:

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105. A sonometer wire is vibrating in resonance with a tuning fork.Keeping the tension applied same,the length of the wire is doubled.Under what conditions would the tuning fork still be in resonance with the wire?

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106. An organ pipe of length L open at both ends is found to vibrate in its first harmonic when sounded with a tuning fork of 480 Hz. What should be the length of a pipe closed at one end,so that it also vibrates in its first harmonic with the same tuning fork?

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107. A tuning fork A,marked 512 Hz, produces 5 beats per second,when sounded with another unmarked tuning fork B.If B is loaded with wax the

number of beats is again 5 per second.What is the frequency of the tuning fork B when not loaded?

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108. The displacement of an elastic wave is given by the function $y = 3\sin\omega t + 4\cos\omega t$ where y is in cm and t is in second. Calculate the resultant amplitude.

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109. A sitar wire is replaced by another wire of same length and material but of three times the earlier radius.If the tension in the wire remains the same,by what factor will the frequency change?

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110. At what temperature (in($\hat{}$ $\circ C$)) will the speed of sound in air be 3 times its value at $0^{\circ} C$?

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111. When two wavs of almost equal frequencies n_1 and n_2 reach at a point simultaneously, what is the time interval between successive maxima?

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112. A steel wire has a length of 12 m and a mass of 2.10 kg. What will be the speed of a transverse wave on this wire when a tension of $2.06 \times 10^4 N$is applied?

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113. A pipe 20 cm long is closed at one end. Which harmonic mode of the pipe is resonantly excited by a 430 Hz source ? Will the same source be in resonance with the pipe if both ends are open? (speed of sound in air is $1340ms^{-1}$)

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114. A train standing at the outer signal of a railway station blows a whistle of frequency 400 Hz in still air .The train begins to move with a speed of $10ms^{-1}$ towards the platform. What is the frequency of the sound for an observer standing on the platform?(sound velocity in air = $(330ms^{-1})$)

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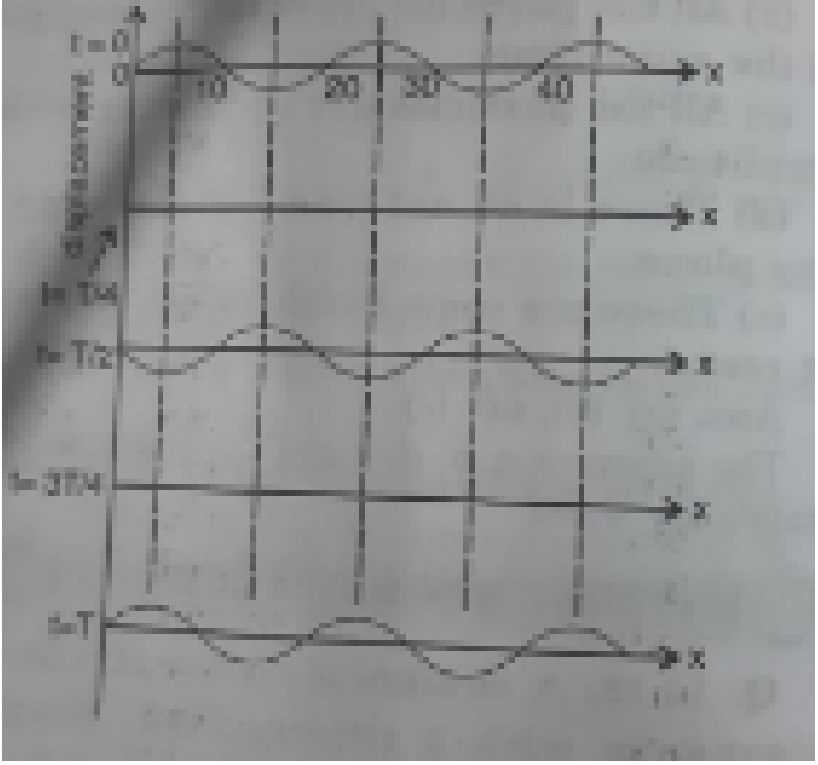
115. The wave pattern on a stretched string is shown in the figure. Interpret what kind of wave this is and find its wavelength?



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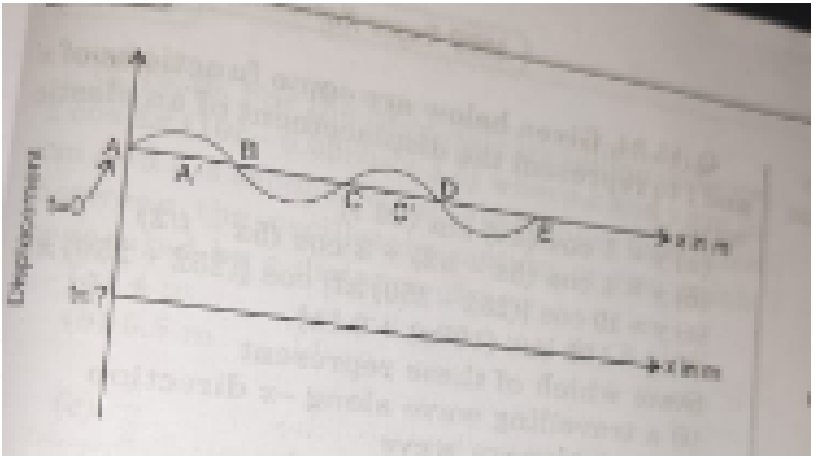
116. The pattern of standing waves formed on a stretched string at two instants of time are shown in the figure.The velocity of two waves superimposing to form stationary waves in $360ms^{-1}$ and their frequencies are 256 Hz.

Calculate the time at which the second curve is plotted.



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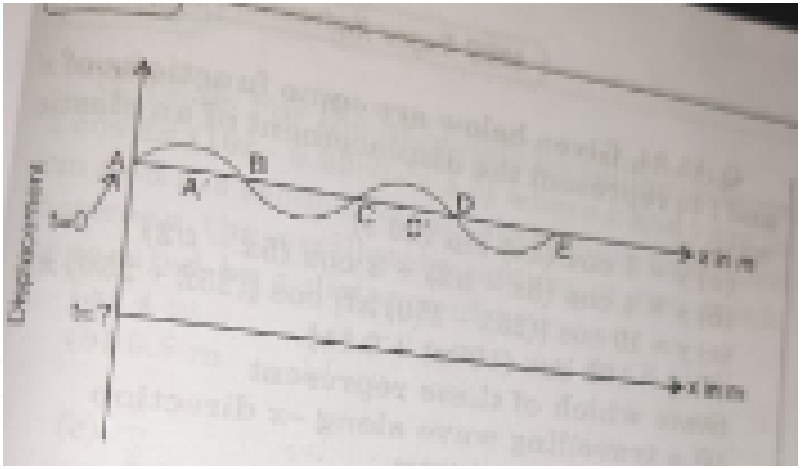
117. The pattern of standing waves formed on a stretched string at two instants of time are shown in the figure.The velocity of two waves superimposing to form stationary waves in $360ms^{-1}$ and their frequencies are 256 Hz.

Mark nodes and antinodes on the curve.



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118. Show that when a string fixed at two ends vibrates in 1 loops,2 loops,3 loops and 4 loops, the frequencies are in the ratio 1:2:3:4.

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119. The earth has a radius of 6400 km . The inner core of 1000km radius is solid. Outside it, there is a region from 1000 km to a radius of 3500 km which is in molten state. Then again from 3500 km to 6400 km the earth

is solid.Only longitudinal (P) waves can travel inside a liquid. Assume that the P wave has a speed of $8kms^{-1}$ in solid parts and of $5kms^{-1}$ in liquid parts of the earth. An earthquake occur at some place closer to the surface of the earth.CAlculate the time after which it will be recorded in a seismometer at a diametrically opposite point on the earth if wave travels along diameter?

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120. If c is r.m.s. speed of molecules in a gas and v is the speed of sound wave in the gas , show that c/v is constant and independent of temperature for all diatomic gases.

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121. Given below are some functions of x and t to represent the displacement of an elastic wave.

y= 5 cos (4x) sin (20t)

State which of these represent

(a) a travelling wave along (−x) direction

(b) a stationary wave (c) beats

(c) a travelling wave along (+x) direction.

Give reasons for the answers.

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122. Given below are some functions of x and t to represent the displacement of an elastic wave.

$y=4 \cos (5x-t/2)+3 \cos (5x-t/2)$.

State which of these represent

(a) a travelling wave along (−x) direction

(b) a stationary wave (c) beats

(c) a travelling wave along (+x) direction.

Give reasons for the answers.

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123. Given below are some functions of x and t to represent the displacement of an elastic wave.

$y = 10\cos[(252 - 250)\pi t]\cos[(252 + 250)\pi t]$

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124. Given below are some functions of x and t to represent the displacement of an elastic wave.

$y = 100\cos(100\pi t + 0.5x)$

State which of these represent

a travelling wave along -x direction

a stationary wave

beats

a travelling wave along $+_x$ directions.

Given reason for your answers.

Watch Video Solution

125. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$

where y and x are in m, t in s. What is the

amplitude

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126. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$

where y and x are in m, t in s. What is the

wavelength

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127. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$

where y and x are in m, t in s. What is the

frequency

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128. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$

where y and x are in m, t in s. What is the

wave velocity

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129. In the given progressive wave $y = 5\sin(100\pi t - 0.4\pi x)$

where y and x are in m, t in s. What is the

particle velocity amplitude?

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130. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of 4m.

Watch Video Solution

131. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of 0.5 m.

Watch Video Solution

132. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of $\gamma/2$.

Watch Video Solution

133. For the travelling harmonic wave y(x, t) = $2.0\cos 2\pi(10t - 0.0080x + 0.35)$ where xand y are in cm and tin s. Calculate the phase difference between oscillatory motion of two points separated by a distance of $(3\gamma)/4$.

Watch Video Solution

134. For the harmonic travelling wave $y = 2\cos 2\pi(10t - 0.0080x + 3.5)$ where x and y are in cm and t is second.

What is the phase difference between the osciallition of a particle located at x=100 cm, at t=Ts and t=5s?

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135. Water waves are:

A. Longitudinal

B. Transverse

C. Both longitudinal and transverse

D. Neither longitudinal nor transverse

Answer:

Watch Video Solution

136. Velocity of sound is maximum in:

A. He

B. N_2

C. H_2

D. O_2

Answer:

Watch Video Solution

137. Distinguish between sound waves and light waves.

A. Interference

B. Refraction

C. Polarisation

D. Feflection

Answer:

Watch Video Solution

138. Two sound waves of slightly different frequencies propagating in the same direction produce beats due to:

A. Interference

B. Diffraction

C. Reflection

D. Refraction

Answer:

Watch Video Solution

139. Change in temperature of the medium changes

A. Frequency

B. Amplitude

C. Wavelength

D. loudness

Answer:

Watch Video Solution

140. Human ear cannot hear those mechanical waves whose frequency lies in the frequency range:

A. Less than 1000Hz but greater than 10000 Hz

B. Between 1000 Hz and 5000 Hz

C. Between 500 Hz and 20000 Hz

D. Less than 20 Hz and more than 2000 Hz.

Answer:

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141. At a given temperature ,velocity of sound in oxygen and in hydrogen has the ratio:

A. 4:1

B. 1:4

C. 1:1

D. 2:1

Answer:

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142. A wave along a string has the following equation (y,x in metre and t in sec) y=0.02 sin (30t-4.0x) Find Amplitude

A. 0.02m

B. 0.04m

C. 4.0m

D. 30m

Answer:

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143. When a wave is reflected from a denser medium, the change in phase is:

A. 0

B. π

C. 2π

D. 3π

Answer:

Watch Video Solution

144. If the speed of sound in air at 0^C is $331ms^{-1}$. What will be its value at $35^\circ C$?

A. $331ms^{-1}$

B. $366ms^{-1}$

C. $351.6ms^{-1}$

D. $332ms^{-1}$

Answer:

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145. In a longitudinal wave, pressure variation and displacement variation are:

A. 180° out of phase

B. 70° out of phase

C. 45° out of phase

D. In phase.

Answer:

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146. In a stationary wave.

A. particle move periodically

B. All particles are at rest

C. Amplitude is same at all places

D. Amplitude is maximum at some places and minimum at some other.

Answer:

Watch Video Solution

147. In the principle of superposition, the characteristics that get add vectorially is:

A. Displacement

B. Velocity

C. Amplitude

D. Frequency

Answer:

Watch Video Solution

148. The phase difference between two particles of a medium lying just on the opposite sides of a node is:

A. Zero

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

C. π

D. 2π

Answer:

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149. A tuning is made of:

A. Steel

B. Iron

C. Invar

D. Elinvar

Answer:

Watch Video Solution

150. When an open pipe is producing third harmonic,number of nodes is:

A. 1

B. 2

C. 3

D. 4

Answer:

Watch Video Solution

151. As an empty vessels is filled with water, its frequency:

A. Increases

B. Decreases

C. Remains the same

D. None of these

Answer:

Watch Video Solution

152. When a source of sound moves towards stationary observer,the wavelength of sound received by the observer

A. Increases

B. Decreases

C. Remains the same

D. Cannot say.

Answer:

Watch Video Solution

153. In case of a moving source of sound approaching an observer.

A. The wavelength of sound appears to be less

B. The wavelength of sound appears to be more

C. The frequency appears to be less

D. None of these.

Answer:

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154. If an open pipe of length l vibrates in fundamental mode,then pressure variation is maximum at:

A. Ends of pipe

B. Middle of pipe

C. One fourth from ends of pipe

D. One third from ends of pipe

Answer:

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155. Fill in the blanks:

Wave motion is a form of_____.

Watch Video Solution

156. Fill in the blanks:

___formula for velocity of sound in a gaseous medium was modified by_____.

Watch Video Solution

157. Fill in the blanks:

Pressure has_____on the velocity of sound.

Watch Video Solution

158. Fill in the blanks:

Sound travels_____in moist air.

Watch Video Solution

159. Fill in the blanks:

Velocity of sound waves is _____of their amplitude.

Watch Video Solution

160. Fill in the blanks:

Velocity of sound in a gas is proportional to the square root of its____.

Watch Video Solution

161. Fill in the blanks:

Wave function describe mathematically the_____of the wave pulse.

Watch Video Solution

162. Fill in the blanks:

When reflection takes place at rarer medium,compression is reflected as_____.

Watch Video Solution

163. Fill in the blanks:

Stethoscope uses the reflection of _____waves.

Watch Video Solution

164. Fill in the blanks:

Beats are used in_____of musical instrument.

Watch Video Solution

165. Define the terms wave and wave motion.

Watch Video Solution

166. What is transported during wave motion in a medium?

Watch Video Solution

167. Do all waves require a medium to travel through?Give examples.

Watch Video Solution

168. On dropping a pebble in still water, what type of waves are produced on the surface of water?

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169. How is velocity of sound affected by an increase of presssure?

Watch Video Solution

170. Why do we say that sound waves are mechinal in character?

Watch Video Solution

171. What is the nature of sound Longitudinal wave or Transverse wave ?

Watch Video Solution

172. What is the range of audible sound waves?

Watch Video Solution

173. Can we concentrate the sound waves at a particular point?

Watch Video Solution

174. Give two differences between progressive and stationary waves.

Watch Video Solution

175. What are pressure waves?

Watch Video Solution

176. Is the phenomenon of interference,characteristics of all wave motion?

Watch Video Solution

177. What is the cause of Doppler's effects when the observer is in motion?

Watch Video Solution

178. What conclusion can be drawn from red shift?

Watch Video Solution

179. What will you hear if you were to move away from a siren with speed of sound?

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180. An explosion takes place at the bottom of a lake.What type of waves are produced inside the water?

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181. Which characteristic of the medium determine the velocity of longitudinal sound waves in a medium?

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182. In which gas - H_2 or O_2 will sound travel with greater speed under given conditions of temperature and pressure?

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183. What is the distance between two consecutive nodes?

Watch Video Solution

184. Does the change in frequency due to Doppler's effects depends on the distance between the source and the listner?

Watch Video Solution

185. _____xx wavelength = velocity.

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186. When density of a gas is doubled, the velocity of sound in it will become_____times.

Watch Video Solution

187. Water waves are:

Watch Video Solution

188. Sound travels by_____waves in air.

Watch Video Solution

189. Flute is an example of_____.

Watch Video Solution

190. Pitch of sound depends upon_____.

Watch Video Solution

191. What is wave? What are types of wave?

Watch Video Solution

192. Establish the relation between wave velocity, wavelength and frequency of a wave.

Watch Video Solution

193. Show that the Phase velocity = Angular velocity/Propagation constant

Watch Video Solution

194. What is the effect of temperature on the velocity of sound?Derive the relation.

Watch Video Solution

195. What is the nature of sound Longitudinal wave or Transverse wave ?

Watch Video Solution

196. Define wave functions.

Watch Video Solution

197. In which case is the speed of sound greater air,liquid and a solid? Give examples.

Watch Video Solution

198. At what temperature will the speed of sound in air become double of its value of $0^\circ C$?

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199. If we place our ar at the end of a long pipe and ask our friend to hammer at the other end,we will hear two distinct type of sound.Explain why?

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200. What is the velocity of wave in a sting of line or mass density m when strotched to tension T?

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201. Are particle velocity and wave velocity the same?

Watch Video Solution

202. When sound travels through gases,is it under isothrmal condition or adiabatic conditions?And why?

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203. Define coefficient of velocity of sound and show that it is $0.61ms^{-1}c^{-1}$.

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204. What is the minimum distance of the obstacle from the source of sound for hearing distinct echo ?

Watch Video Solution

205. What are the factor on which the velocity of sound of a stretched vibrating string depends?

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206. What are standing waves or stationary waves?Why are they so called?

Watch Video Solution

207. What is practical importance of stationary waves in sound?

Watch Video Solution

208. How is it that strings vibrate in transverse manner and produce longitudinal waves?

Watch Video Solution

209. What is the difference between Interference and Beats?

Watch Video Solution

210. The facts that we have two ears enables us to sense the direction fromwhich a sound is coming.This depends on the interference principle.Explain.

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211. A tuning fork has two prongs.Why?

Watch Video Solution

212. What is the use of stem of a tuning fork?

Watch Video Solution

213. We cannot hear beats.when beat frequency is more than 10.why?

Watch Video Solution

214. To hear beats,it is essential to have two frequencies very close to each other.Why?

Watch Video Solution

215. What is the apparent change in frequency when source and observer move with same velocity in the same direction?

Watch Video Solution

216. What is red shift?

Watch Video Solution

217. What are different types of wave motions?

Watch Video Solution

218. Define the terms compression , rarefaction, crest , trough , wavelength , frequency , time period .

Watch Video Solution

219. Explain the propogation of a wave through a medium using the analogy of a collection of springs connected to each other.

Watch Video Solution

220. Show with an experiment that air contains water vapours.

Watch Video Solution

221. Write the expression for the speed of propagation of transverse and longitudinal waves in different media and check these relations dimensionally.

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222. Derive Newton's formula for velocity of sound in air. Point out the error and hence discuss Laplace's correction to find out the velocity of sound.

Watch Video Solution

223. Which characteristic of the medium determine the velocity of longitudinal sound waves in a medium?

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224. What is the shape of the wave when two wave pulses travelling in the opposite direction cross each other?

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225. State superposition principle. Give examples by drawing suitable diagrams.

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226. What is the limitations of the principle of superposition of waves?

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227. Explain reflection of waves and find the general expression for the resultant displacement when direct and reflected waves overlap.

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228. Explain how does the reflection of wave from a rigid boundary changes the shape of the pulse?

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229. Give two practical applications of reflection of sound waves.

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230. Derive displacement relation for a progressive wave.

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231. What is a harmonic wave? Determine an expression for it.

Watch Video Solution

232. Explain phase and phase difference in waves and hence define wavelength and time period.

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233. Explain that a periodic wave may have in general so many harmonic component waves. What are harmonics?

Watch Video Solution

234. What are standing waves or stationary waves?Why are they so called?

Watch Video Solution

235. What are normal modes?

Watch Video Solution

236. Find expression for the various harmonics in a vibration string fixed at the two ends.Hence predict the position of nodes and antinodes.

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237. What do you mean by an organ pipe? Derive exprssion for stationary waves formed in a closed organ pipe and discuss normal modes of vibration of the pipe.

Watch Video Solution

238. Derive expression for stationary waves formed in an open organ pipe anad discuss normal modes of vibration of the pipe.

Watch Video Solution

239. Give two differences between progressive and stationary waves.

Watch Video Solution

240. What are beats? Discuss the formation of beats analytically as well as graphically.

Watch Video Solution

241. Explain Doppler effect.Find an expression for the change in frequency.

Watch Video Solution

242. State Doppler's Effect.

Watch Video Solution

243. What is the apparent change in frequency when source and observer move with same velocity in the same direction?

Watch Video Solution

244. What is the apparent change in frequency when source and observer move with same velocity in the same direction?

Watch Video Solution

245. Derive the folowing relation by the method of dimensions

$$v = \sqrt{\frac{T}{\mu}}$$

T=Tension, μ=mass per unit length.

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246. Derive the folowing relation by the method of dimensions

$$v = \sqrt{\frac{E}{\rho}}$$

E=coefficient of elasticity,ρ=density of medium.

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

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248. A metre-long tube open at one end, with a movable piston at the other end, shows resonance with a fixed frequency source (a tuning fork of frequency 340 Hz) when the tube length is 25.5 cm or 79.3 cm. Estimate the speed of sound in air at the temperature of the experiment. The edge effects may be neglected.

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249. A wire of mass $9.8 \cdot 10^{-3}$kg per metre passes over a friction less pulley fixed on the top of an inclined friction less plane which makes an angle of 30° with the horizontal. Masses M_1 and M_2 are tied at the two

end of the wire. The mass M_1 rests on the plane and the mass M_2 hangs vertically downward. The whole system is in equilibrium. Now a transverse wave propagates along the wire with a velocity of $100ms^{-1}$. Find the values of masses M_1 and M_2. Take g= $9.8ms^{-2}$.

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250. One end of a long string of linear mass density 8.0×10^{-3} kg m^{-1} is connected to an electrically driven tuning fork of frequency 256 Hz. The other end passes over a pulley and is tied to a pan containing a mass of 90 kg. The pulley end absorbs all the incoming energy so that reflected waves at this end have negligible amplitude. At t= 0, the left end (fork end) of the string x = 0 has zero transverse displacement (y = 0) and is moving along positive y-direction. The amplitude of the wave is 5.0 cm. Write down the transverse displacement y asfunction of x and tthat describes the wave on the string

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251. A load of 20 kg is suspended by a steel wire in a sonometer experiment velocity of waves when the wire is rubbed with a resined cloth along the length is 20 times the velocity of waves in the same string when its plucked. Find area of cross- section of the wire,if Y for steel is $19.6 \times 10^{10} Nm^{-2}$ and $g = 9.8 ms^{-2}$.

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Exercise

1. Can mechanical waves travel through vacuum?

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2. Which waves do not require medium for propagation?

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3. What is the speed of mechinical wave?

Watch Video Solution

4. What is the speed of electromagnetic wave?

Watch Video Solution

5. What kind of sound waves are produced in air ?

Watch Video Solution

6. On dropping a pebble in still water, what type of waves are produced on the surface of water?

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7. Define wave motion.What are its characteristics?

Watch Video Solution

8. The speed of sound waves depends on temperature but speed of light waves does not, why?

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9. Discuss the term 'phase' in a wave motion.

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10. Why stationary wave is so called?

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11. Discuss the main characteristics of stationary waves.

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12. Calculate the increase in velocity of sound produced by $1^{\circ}C$ rise in temperature,if the velocity of sound at $0^{\circ}C$ is $332ms^{-1}$?

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13. Explain briefly the analytical method of formation of beats.

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14. What is Doppler's effect?Derive a general expression for the apparent frequency when both source and observer are in relative motion.

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