PHYSICS

BOOKS - MAXIMUM PUBLICATION

WAVES

Exercise

1. Velocity of sound in vaccume is

A. $330ms^{-1}$

B. $165ms^{-1}$

C. $zero$

D. $660ms^{-1}$

Answer: C

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2. The physical quantity that remains unchanged when a sound wave goes from one medium to another is

A. amplitude

B. speed

C. wavelength

D. frequency

Answer: D

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3. What is the range of frequency of audible sound?

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4. Why does sound travel faster in iron than in air?

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5. What kind of waves help the bats to find their way in dark?

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6. In which gas,hydrogen and oxygen will the sound have greater velocity?

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7. Why transverse waves can not setup in gas?

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8. What is the effect of presure on the velocity of sound waves?

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9. Why bells are made up of metal and not wood?

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10. What is the velocity of sound in perfect rigid body?

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11. In resonance column experiment, tuning fork is used. a) Name the type of the wave produced by tuning fork

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12. Why bells of colleges and temple are of large size?

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13. A sound wave of frequency $400Hz$ is travelling in air at a speed of $320\frac{m}{s}$. Calculate the difference in phase between two points on the wave $0.2m$ apart in the direction of travel.

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14. A string fixed one end is suddenly brought in to up and down motion.a)What is the nature of the wane produced in the string and name the wave.b)A brass wire 1m long has

mass 6×10^{-3} kg.If it is kept at a tension 60N,What is the speed of the wave on the wire.

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15. A sonometer wire of length $30cm$ vibrates in the second overtone

A violin string resonates in its fundamental frequency of $196hz$.Where along the string must you place your finger so that the

fundamental frequency becomes $440hz$,If the length of violin string is $40cm$.

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16. A horizontal metal wire is fixed on a state of tension between two vertical supports when plucked it gives a fundamental frequency f_0.

Obtain a mathematical expression for f_0.

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17. A horizontal metal wire is fixed on a state of tension between two vertical supports when plucked it gives a fundamental frequency f_0. A $5.5m$ wire has a mass of $0.035kg$,if the tension of the string is $77N$,the speed of wave on the string is

a)$110ms^{-1}$

b)$11\sqrt{10}ms^{-1}$

c)$77ms^{-1}$

d)$11ms^{-1}$

e)$102ms^{-1}$.

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18. A horizontal metal wire is fixed on a state of tension between two vertical supports when plucked it gives a fundamental frequency f_0. What change,if any,will be observed in the fundamental frequency if the wire is now immersed in water and plucked again?

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19. When a stone is dropped into the river,certain waves are formed on its surface.

What type of wave it is?

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20. When a pebble is dropped,to the surface of water,certain waves are formed on the water surface.

Is it a progressive wave?Explain.

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21. When a pebble is dropped,to the surface of water,certain waves are formed on the water surface.

The equation for such a wave is $y = 4\sin\pi(2t - 0.01x)$,Where y and x are in cm and t in seconds,Find its

a)amplitude,

b)wave length,

c)initial phase,

d)Frequency.

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22. The speed of a wave along a stretched string depends only on the tension and linear mass density of the string and does not dependent on the frequency of the wave.

Give the equation of speed of transverse wave along a stretched string.

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23. The speed of a wave along a stretched string depends only on the tension and linear

mass density of the string and does not dependent on the frequency of the wave.

Why the speed does not depend on the frequency of the wave.

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24. The speed of a wave along a stretched string depends only on the tension and linear mass density of the string and does not dependent on the frequency of the wave.

A steel wire 0.72 long has a mass of

$5 \times 10^{-3} kg$,if the wire is under a tension $60N$,what is the speed of transverse wave on the wire?

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25. While discussing the propagation of sound through atmospheric air,one argued that the velocity of sound is $280 ms^{-1}$ and said that he calculated it using Newton's formula.But another learner argued that velocity of sound is $330 ms^{-1}$.He justified his arguement by

saying that he has applied Laplace corrected formula.

Write the formula used by the second learner.

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26. While discussing the propagation of sound through atmospheric air,one argued that the velocity of sound is $280ms^{-1}$ and said that he calculated it using Newton's formula.But another learner argued that velocity of sound is $330ms^{-1}$.He justified his arguement by

saying that he has applied Laplace corrected formula.

Using the above relation,show that velocity depends on temperature and humidity while is independent of pressure.

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27. "Sound can be heard over longer distance on rainy days"-Justify.

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28. When a stone is dropped into the river,certain waves are formed on its surface. What type of wave it is?

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29. When a stone is dropped into the river,certain waves are formed on its surface. Is it a progressive wave?Explain?

Watch Video Solution

30. When a stone is dropped into the river,certain waves are formed on its surface. derive a mathematical expression for the above wave.

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31. A boy standing near a railway track found that the pitch of the siren of a train increases as it approaches him.

State the phenomenon behind it.

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32. A boy standing near a railway track found that the pitch of the siren of a train increases as it approaches him.

List two any applications of the same phenomenon.

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33. A boy standing near a railway track found that the pitch of the siren of a train increases

as it approaches him.

State the phenomenon behind it.

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34. Waves are means of transferring energy from one point to another.Distinguish between longitudinal and transverse waves.

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35. The velocity of sound is greater in solids than in gases.Explain.

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36. A pipe $30cm$ long is open at both ends.Which harmonic mode of the pipe is resonantly exerted by a $1.1kHz$ source?

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37. A boy plucks at the centre of a stretched string of length $1m$ and observes a wave pattern.

Which type of wave is produced on the string?

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38. A boy plucks at the centre of a stretched string of length $1m$ and observes a wave pattern.

What are the conditions for the formation of the above mentioned wave?

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39. A boy plucks at the centre of a stretched string of length $1m$ and observes a wave pattern.

The distance between consecutive nodes is

i) λ

ii) $\frac{\lambda}{2}$

iii)2λ

iv)$lamdb\frac{a}{4}$.

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40. A steel rod $100cm$ long is clamped at its middle.The fundamental frequency of longitudinal vibrations of the rod is given to be $2.5kHz$.What is the speed of sound in steel?

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41. A string of mass $2.50kg$ Is under a tension of $200N$. The length of the stretched string Is $20.0m$. 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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42. A stone droped from the top of a tower of height $300m$ high splashes into the water of a pond near the base of the tower. When Is the splash heard closed at the top. Glven thet the

speed of sound in air is resonance $340ms^{-1}$?

$(g = 9.8ms^{-1})$

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43. 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 $1.7km^{-1}$. The operating frequency of the scanner is 4.2MHz.

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44. A wire stretched between two rigid supports vibrates in Its fundamental mode with a frequency of $45Hz$. The mass of the wire is $3.5x10^{-2}kg$ and its linear mass density is `4.0 x 10^(-2)kgm^(-3)'. What is the speed of a transverse wave on the string ?

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45. A wire stretched between two rigid supports vibrates in Its fundamental mode with a frequency of $45Hz$. The mass of the

wire is $3.5x10^{-2}kg$ and its linear mass density is `4.0 x 10^(-2)kgm^(-3)'. What is the tension in the string?

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46. A steel rod $100cm$ long is clamped at its middle.The fundamental frequency of longitudinal vibrations of the rod is given to be $2.5kHz$.What is the speed of sound in steel?

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47. Nobody can Imagine a world without sound. Sound is a part of our life- musics, ripples, echoes etc. have a lot of applications. Can you say how a bat can ascertain directions and distances without any 'eyes'?

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48. Nobody can Imagine a world without sound. Sound is a part of our life- musics, ripples, echoes etc. have a lot of

applications.Doctors use an ultrasonic scanner to diagnose tumour tissues. If the frequency of the scanner is locate $4.2MHz$and the speed of sound wave in the tissue of is $1.7kms$ find the wavelength of the sound wave.

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49. A flute is an example of an open pipe.Sketch the pattern of wave forms of the first two harmonics fomed in an open pipe.

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50. A flute is an example of an open pipe.Show that in an open pipe the frequencies of the first 3 harmonics are in the ratio $1:2:3$.

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51. Wave motion is a propagatlon of energy through a material medium due to repeated periodic motion.Transverse waves cannot be propagated through gases. Why?

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52. While discussing the propagation of sound through atmospheric air,one argued that the velocity of sound is $280ms^{-1}$ and said that he calculated it using Newton's formula.But another learner argued that velocity of sound is $330ms^{-1}$.He justified his arguement by saying that he has applied Laplace corrected formula.

Write the formula used by the second learner.

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53. What was the condition assumed by Laplace In comecting Newton's equation for the velocity of sound in a gas? Write the Newton-Laplace equation.

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54. In resonance column experiment, tuning fork is used. a) Name the type of the wave produced by tuning fork

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55. In a laboratory Raju uses a tuning fork in resonance column experiment.Mention any four characteristics of these waves.

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56. While conduting a resonance column experiment In the laboratory, you can hear the maximum sound at a certain height.Explain the phenomenon of sound.

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57. While conduting a resonance column experiment In the laboratory, you can hear the maximum sound at a certain height.Open pipes are prefered to closed ones in muscal instruments. Why?

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58. A transverse harmonic wave on a string is described by $y(x, t) = 3.0 \sin\left(36t + 0.018x + \left(\frac{\pi}{4}\right)\right)$ where x and y are in centimeters and t in seconds. The positive direction of x is from left to right.If it is a traveling wave, what is its speed?

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59. A transverse harmonic wave on a string is described by $y(x,t) = 3.0\sin\left(36t + 0.018x + \frac{\pi}{4}\right)$ where 'x' and 'y' are in cm and 't' is in s. The positive direction of 'x' is from left to right. What are is amplitude and frequency?

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60. A transverse harmonic wave on a string is described by

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where x and y are in centimeters and t in seconds. The positive direction of x is from left to right.What is the initial phase at the origin?

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62. A boy plucks at the centre of a stretched string of length $1m$ and observes a wave pattern.

What are the conditions for the formation of the above mentioned wave?

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63. A student plucks at the center of a stretched string tube it and observes the wave pattern produced.Plot the above wave pattern pictorially. Label the each nodes and the antinodes on the pattern.

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64. A sound travelling along a string is described by $y = 0.005 \sin(80.0x - 3.0t)$ .calculate-Amplitude

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65. A sound travelling along a string is described by $y = 0.005 \sin(80.0x - 3.0t)$ .calculate-wavelength

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66. Where will a man hear a louder sound in the case of stationary wave (node or antinode)? Why?

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67. The equation for a wave is given below $y = A\sin(kx + \text{omega}t)$.Is ita travelling or stationary wave?

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68. A transverse harmonic wave on a string is described by $y(x, t) = 3.0\sin\left(36t + 0.018x + \left(\frac{\pi}{4}\right)\right)$ where x and y are in centimeters and t in seconds. The positive direction of x is from left

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77. In resonance column experiment, we can hear maximum sound at a certain height. This is due to the phenomenon of resonance.Show

that for a pipe closed at one end, the frequencies are in the ratio $(u_1):(u_2):(u_3) = 1:3:5$

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80. A woman is traveling in a car at a speed of $25\frac{m}{s}$. She is moving away from a source producing a sound of $512Hz$.Calculate the

frequency of sound heard by ner .(Speed of sound in air=$340\frac{m}{s}$)

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81. A woman is traveling in a car at a speed of $25\frac{m}{s}$. She is moving away from a source producing a sound of $512Hz$.Name the phenomenon that explains this variation in frequency.

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