PHYSICS

BOOKS - JEEVITH PUBLICATIONS PHYSICS (KANNADA ENGLISH)

WAVES

One Mark Questions And Answers

1. What is a wave ?

Watch Video Solution

2. What is a pulse ?

Watch Video Solution

3. Given any one difference between a mechanical wave and an electromagnetic wave.

Watch Video Solution

4. What is essential for the production / propagation of a mechanical waves ?

Watch Video Solution

5. Given an example for a mechanical wave.

Watch Video Solution

6. Given an example for a non-mechanical wave.

Watch Video Solution

7. What is the speed of any electromagnetic wave in free space or vacuum or air ?

Watch Video Solution

8. Give an example for a matter wave.

Watch Video Solution

9. What are matter waves ?

Watch Video Solution

10. Name a device in which wave properties of electrons is used.

Watch Video Solution

11. Name any one mechanical property which helps a mechanical medium for the

propogation of sound.

Watch Video Solution

12. Name any one type of mechanical wave.

Watch Video Solution

13. Who proposed the wave nature of light?

Watch Video Solution

14. What is the direction of particle vibration with respect to the direction of the disturbance ?

Watch Video Solution

15. In which mode of vibration does the density of the medium vary ?

Watch Video Solution

16. In which mode of vibration does the density of the medium remains the same ?

Watch Video Solution

17. Give any one characteristic of longitudinal wave motion.

Watch Video Solution

18. Give any one characteristic of transverse wave motion.

Watch Video Solution

19. Given reason why mechanical transverse waves are not possible in fluids and gases.

Watch Video Solution

20. Represent instantaneous displacement of a wave motion.

Watch Video Solution

21. In the equation y (x, t) = A $\sin(\omega t - kx + \phi)$, what does the terms $(\omega t - kt + \phi)$ represent ?

Watch Video Solution

22. Define amplitude of a wave

Watch Video Solution

23. Define phase of the wave.

Watch Video Solution

24. Define wave length. What is its S.I. unit ?

Watch Video Solution

25. Define frequency of wave motion.

Watch Video Solution

26. Mention the S.I. unit of angular wave number or propogation contant.

Watch Video Solution

27. Relate angular and linear frequencies of the wave motion.

Watch Video Solution

28. Why is the velocity of longitude wave (sound) in solids and liquids is greater than in gases ?

Watch Video Solution

29. What are stationary (localised or standing) waves ?

Watch Video Solution

30. What are nodes ?

Watch Video Solution

31. Where are antinodes ?

Watch Video Solution

32. What is the distance between any two consecutive nodes or antinodes ?

Watch Video Solution

33. What is the distance between a node and a consecutive antinode ?

Watch Video Solution

34. What is meant by a fundamental frequency (mode) or first harmonic or vibration of a system?

Watch Video Solution

35. Give the expression for nth harmonic or (n-1)th overtone in the case of a closed pipe system.

Watch Video Solution

36. Write the expression for beat frequency .

Watch Video Solution

37. What are audible beats?

View Text Solution

38. Give the expression for beat period.

Watch Video Solution

39. What is Doppler effect? Write any two applications of it.

Watch Video Solution

40. What will be the wavelength of sound when the source of sound is moving towards the stationary observer ?

View Text Solution

41. What happens to the wavelength of sound when the source of sound is at rest and the observer moving towards it ?

View Text Solution

42. Write the expression for apparent frequency of sound for source and listener moving in the same direction in a still air.

Watch Video Solution

43. What are overtones ?

Watch Video Solution

44. What is meant by a closed pipe system ?

Watch Video Solution

45. What is meant by an open pipe system ?

Watch Video Solution

46. Write the first three harmonics in the case of a closed pipe system.

Watch Video Solution

47. The harmonics in a pipe system are 1028 Hz, 2056Hz, 3084Hz.Name the pipe system.

Watch Video Solution

48. Define intensity of a wave.

Watch Video Solution

49. Mention the S.I unit of intensity of wave.

Watch Video Solution

Two Marks Questions With Answers

1. Why does wave velocity remain a constant whereas particle velocity does not ?

Watch Video Solution

2. Define velocity of wave motion. Give the expression wave velocity.

Watch Video Solution

3. Write an equation for a progressive wave travelling along the positive x -direction with an epoch zero.

Watch Video Solution

4. Give the expression for the speed of the transverse wave on a stretched string along with the meanings of the symbols used.

Watch Video Solution

5. Give the expression for the frequency of vibration on a stretched string in a transverse mode of vibration along with the meanings of the symbols used.

Watch Video Solution

6. Give the expression for the velocity of longitudinal wave in an elastic medium along with the meaning of the symbols used.

Watch Video Solution

7. Give the expression for the velocity of sound in air / gaseous media along with the meanings of the symbols used.

Watch Video Solution

8. Give Newton's for velocity of sound in air or gases along with the meanings of the symbols used.

Watch Video Solution

9. What is Laplace correction for velocity of sound in a gaseous medium to the Newton's formula.Give the meanings of the symbols used.

Watch Video Solution

10. Write the instantaneous displacement of a combined wave that represent the stationary wave.

Watch Video Solution

11. Give the expression for resultant displacement of two waves producing beats.

Watch Video Solution

12. Write the expression for apparent frequency for source of sound moving towards a stationary observer.

Watch Video Solution

13. Write the expression for apparent frequency of sound for observer moving towards a stationary source of sound.

Watch Video Solution

14. Write the expression for apparent frequency of sound as heard by a driver of a source of sound moving towards the hill or wall.

Watch Video Solution

15. Give the expression for the fundamental frequency in the case of a closed a pipe system

Watch Video Solution

16. Give the expression for the fundamental frequency in the case of an open pipe system.

Watch Video Solution

17. What will be the speed of infrasonics and ultrasonics in air at $0^{\circ} C$?

Watch Video Solution

Three Marks Questions With Answers

1. Distinguish between mechanical and non-mechanical waves with an example for each type.

Watch Video Solution

2. Name any one type of mechanical wave.

Watch Video Solution

3. Comment on Laplace correction to Newton's formula for velocity of sound in air.

Watch Video Solution

4. Show that Laplace correction for elasticity of gaseous medium is $E = \gamma p$, where $'\gamma'$ is the ratio of specific heates.

View Text Solution

5. Obtain an expression for the instantaneous displacement of a stationary wave.

Watch Video Solution

Five Marks Questions With Answers

1. Show that the distance between any two consecutive nodes or antinodes in a stationary wave is $\lambda / 2$.

Watch Video Solution

2. if two progressive waves travelling in the same direction interfere, then obtain the instaneous displacement of the combined wave.

View Text Solution

3. Give the theory of beats and hence find the expression for beta frequency.

Watch Video Solution

4. Show that only odd harmonics are present in the closed pipe system.

Watch Video Solution

5. Show that both odd and even harmonics are present in an open pipe system.

Watch Video Solution

6. Show that all harmonics are present in a streteched string under a tranverse mode of vibration.

Watch Video Solution

7. Obtain an expression for the apparent frequency of sound for a source moving away and towards a stationary observer.

Watch Video Solution

8. Obtain an expression for the apparent frequency of sound for an observer moving towards / away from a stationary source of sound.

Watch Video Solution

9. Obtain an expression for the aparent frequency of sound when the source of sound and the listener are moving

away from each other

View Text Solution

10. Obtain an expression for the aparent frequency of sound when the source of sound and the listener are moving towards each other.

View Text Solution

11. Distinguish between progressive waves and stationary waves.

Watch Video Solution

Numericals With Solutions

1. A string of mass 2.50kg is under a tension of 200N.The length of the stretched string is 20.0

m. If a transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end ?

Watch Video Solution

2. A stone dropped from the tope 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 at the top, given that the speed of sound in air is $340ms^{-1}$? ($g = 9.8ms^{-2}$)

Watch Video Solution

3. A steel has a length of 12.0m and a mass of 2.10kg . What should be the tension in the wire so that speedof a transverse wave on the wire equals the speed of sound in dry airat $20^{\circ}C$ equals $343ms^{-1}$?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

9. 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 $1.7kms^{-1}$? The operating frequency of the scanner is 4.2 MHz.

Watch Video Solution

10. A transverse harmonic wave on a string is described by $y(x,t) = 30\sin\left(36t + 0.018x + \frac{\pi}{4}\right)$ where x and y are in cm and t is in s.The positive direction of x is from left to right.

Is this a travelling wave or a stationary wave ?

If it is travelling, what are the speed and direction of its propagation ?

Watch Video Solution

11. A transverse harmonic wave on a string is described by $y(x, t) = 30 \sin\left(36t + 0.018x + \frac{\pi}{4}\right)$ where x and y are in cm and t is in s.The positive direction of x is from left to right.

What are its amplitude and frequency ?

Watch Video Solution

12. A transverse harmonic wave on a string is described by $y(x,t) = 30\sin\left(36t + 0.018x + \frac{\pi}{4}\right)$ where x and y are in cm and t is in s.The positive direction of x is from left to right.

What is the initial phase at the origin ?

Watch Video Solution

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

$y(x, t) = 30 \sin\left(36t + 0.018 + \frac{\pi}{4}\right)$ where x and y are in cm and t is in s.The positive direction of x is from left to right.

What is the least distance between two successive crests in the wave ?

Watch Video Solution

14. For the travelling harmonic wave $y(x, t) = 20 \cos 2\pi(10t - 0.0080x + 0.35)$ where x, y are in cm and t isin s.Calculate the phase difference between oscillary motion of

two points separated by a distance of

4m

Watch Video Solution

15. For the travelling harmonic wave

$y(x, t) = 20 \cos 2\pi(10t - 0.0080x + 0.35)$

where x, y are in cm and t isin s.Calculate the phase difference between oscillary motion of two points separated by a distance of

0.5m

Watch Video Solution

16. For the travelling harmonic wave $y(x, t) = 20 \cos 2\pi(10t - 0.0080x + 0.35)$ where x, y are in cm and t isin s.Calculate the phase difference between oscillary motion of two points separated by a distance of $\left(\frac{\lambda}{2}\right)$

Watch Video Solution

17. For the travelling harmonic wave $y(x, t) = 20 \cos 2\pi(10t - 0.0080x + 0.35)$

where x, y are in cm and t isin s.Calculate the phase difference between oscillary motion of two points separated by a distance of $\left(\frac{3\lambda}{4}\right)$

Watch Video Solution

18. The transverse displacement of a string is given by $y(x,t) = 0.06\sin\left(\frac{2\pi}{3}\right)x\cos(120\pi t)$ where 'x' & 'y' are 'm' and 't' is s. The length of the string is 1.5m and its mass is $3.0 \times 10^{-2} kg$.

Does the function represent a travelling wave or stationary wave ?

Watch Video Solution

19. The transverse displacement of a string is given by $y(x, t) = 0.06 \sin\left(\frac{2\pi}{3}\right) x \cos(120\pi t)$ where 'x' & 'y' are 'm' and 't' is s. The length of the string is 1.5m and its mass is $3.0 \times 10^{-2} kg$. Interpret the wave as a superposition of two waves travelling in opposite direction. What is

the wavelength, frequency and speed of each wave?

Watch Video Solution

20. The transverse displacement of a string is given by $y(x, t) = 0.06 \sin\left(\frac{2\pi}{3}\right) x \cos(120\pi t)$ where 'x' & 'y' are 'm' and 't' is s. The length of the string is 1.5m and its mass is $3.0 \times 10^{-2} kg$. Determine the tension in the string.

Watch Video Solution

21. A wire stretched between two rigid supports vibraes in its fundamental mode with a frequency of45 Hz. The mass of the wire is $3.5 \times 10^{-2} kg$ and its linear mass density is $4.0 \times 10^{-2} kgm^{-1}$. What is (a) the speed of transverse wave on the string and (b) the tension in the string ?

Watch Video Solution

22. 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 340Hz) when the tube length is 0.255m or 0.793m. Estimate the speed of sound in air at the temperature of the experiment. The edge effects may be neglected.

Watch Video Solution

23. A steel rod 1m 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 ?

Watch Video Solution

24. A pipe 0.20m 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 resonance with the pipe if both ends are open ? (Speed of sound in air is $340ms^{-1}$)

Watch Video Solution

25. Two sitar stings A and B playing the note 'ga' are slightly out of tune and produce beats of frequency 6Hz. The tension in the string A is slightly reduced and the beat frequency is found to reduce to by 3Hz. If the original

frequency of a is 324 Hz, then what is the frequency of B ?

Watch Video Solution

26. A train standing a the outer signal of a railway station blows a whistle of frequency 400Hz in still air .

What is the frequency of the whistle for a platform observer when the train

(i) approaches the platform with a speed of $10ms^{-1}$?

(ii) recedes from the platform with a speed of $10ms^{-1}$?

Watch Video Solution

27. A train standing a the outer signal of a railway station blows a whistle of frequency 400Hz in still air . when the train

(i) approaches the platform with a speed of $10ms^{-1}$?

(ii) recedes from the platform with a speed of $10ms^{-1}$?

What is the speed of sound in each case ? The speed of sound in still air can be taken as $340ms^{-1}$

Watch Video Solution

28. 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 s 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 runs towards the yard at a speed of $10ms^{-1}$? The speed of sound in still can be taken as $340ms^{-1}$

Watch Video Solution

29. A travelling harmonic wave on a string is described by

$$y(x,t) = 7.5\sin\left(0.0050x + 12t + \frac{\pi}{4}\right)$$

(a) What are the displacement and velocity of

oscillation of a point at x = 1 cm, t = 1s ? Is this velocity equal to the velocity of propagation ?

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

Watch Video Solution

30. One end of a long string of linear mass density $8.0 \times 10^{-3} kgm^{-1}$ is connected to an electrically driven tuning fork of frequency 256

Hz. The other 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 as a function of x and t that describe the wave on the string.

Watch Video Solution

31. 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 $360kmh^{-1}$. What is the frequency of sound reflected by the submarine ? Take the speed of sound in water to be $1450ms^{-1}$

Watch Video Solution

32. Earthquakes generate sound waves inside the Earth. Unlike gases, the Earth can

experience both transverse and longitudinal sound waves. Typically the speed of S wave is about $4.0kms^{-1}$ and that of P wave is $8.0kms^{-1}$. A seismograph records P and S waves from an earthquake . The first P waves arrives 4 min before the first S wave. Assuming the waves traveling straight line, at what distanc does the earthquake occur ?

Watch Video Solution

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

Watch Video Solution

34. A progressive wave is represented by an equation $y = 5\sin(80\pi t - 0.5\pi x)$, where x, y are in 'm' and 't' in 's'. Find (a) amplitude (b)wavelength (c) frequency (d) velocity of the wave.

Watch Video Solution

35. The speed of sound in Hydrogen $1270 ms^{-1}$. What will be the speed in a

mixture of oxygen and hydrogen mixed by volume ratio $1:4$?

Watch Video Solution

36. A wave travelling along a string is described by $Y(x, t) = 0.005 \sin(80x - 3t)$ in which the numerical constants are in SI units. Calculate amplitude.

Watch Video Solution

37. A wave travelling along a string is described by $Y(x, t) = 0.005 \sin(80x - 3t)$ in which the numerical constants are in SI units. Calculate wavelength

Watch Video Solution

38. A wave travelling along a string is described by $Y(x, t) = 0.005 \sin(80x - 3t)$ in which the numerical constants are in SI units.

Calculate (i) amplitude (ii) the wavelength and (iii) the period and frequency of the wave.

Watch Video Solution

39. A wave travelling along a string is described by $Y(x, t) = 0.005 \sin(80x - 3t)$ in which the numerical constants are in SI units. Calculate (i) amplitude (ii) the wavelength and (iii) the period and frequency of the wave.

Watch Video Solution

40. A progressive wave is represented by an equation $y = 5\sin(80\pi t - 0.5\pi x)$, where x, y are in 'm' and 't' in 's'. Find (a) amplitude (b)wavelength (c) frequency (d) velocity of the wave.

Watch Video Solution

41. A progressive wave is represented by equation $y = 5\sin(80\pi t - 0.5\pi x)$ where x,y are in metre and t is in second. Find Wavelength

Watch Video Solution

42. A progressive wave is represented by an equation $y = 5\sin(80\pi t - 0.5\pi x)$, where x, y are in 'm' and 't' in 's'. Find (a) amplitude (b)wavelength (c) frequency (d) velocity of the wave.

Watch Video Solution

43. A progressive wave is represented by equation $y = 5\sin(80\pi t - 0.5\pi x)$ where x,y are in metre and t is in second. Find Velocity

Watch Video Solution

44. A train producing a siren with a frequency of 1500 Hz approaches a stationary observr with a speed of 72 kmph. What is apparent frequency of sound heard by him when it

crossing him ?(Given velocity of sound $v = 340 ms^{-1}$)

Watch Video Solution

45. A wave travelling along a string is described by $Y(x, t) = 0.005 \sin(80x - 3t)$ in which the numerical constants are in SI units. Calculate (i) amplitude (ii) the wavelength and (iii) the period and frequency of the wave.

Watch Video Solution

46. The transverse wave in a string is represented by $y(x, t) = 7.5 \sin(12\pi t - 0.005x)$ where 'x' and 'y' in cm and 't' in second. Determine (a) Amplitude (b) frequency (c) wavelength and (d) velocity of the wave.

Watch Video Solution