PHYSICS

BOOKS - MTG PHYSICS (ENGLISH)

WAVES

Mcq

1. The produced rays in sonography are

A. Radio waves

B. X-rays

C. Ultrasonic waves

D. Gamma rays

Answer: C

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2. Which of the following wave does not travel in vaccum ?

A. Seismic waves

B. X-rays

C. Light

D. Radio waves

Answer: A

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3. In a transverse wave, the particles of the medium

A. vibrate in a direction perpendicular to the direction of the propagation.

B. vibrate in a direction parallel to the direction or of the propagation

C. move in circle

D. move in ellipse

Answer: A

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4. A transverse wave consists of

A. only crests

B. only troughs

C. both crests and troughs

D. rarefactions and compressions

Answer: C

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5. Ultrasonic waves produced by a vibrating quartz crystal are

A. only longitudinal

B. only transverse

C. both longitudinal and transverse

D. neither longitudinal nor transverse

Answer: A

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6. The sound waves travel fastest:

A. solids

B. liquids

C. gases

D. vacuum

Answer: A

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7. Sound wave in air cannot be polarised because

A. their speed is small

B. they require medium

C. these are longitudinal

D. their speed is temperature dependent

Answer: C

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8. During propagation of a plane progressive mechanical wave,

A. All the particles are vibrating in the same phase.

B. Amplitude of all the particles is equal.

C. Particles of the medium executes SHM

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

Answer: A

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9. The propagation constant of a wave is also calle

its

A. wavelength

B. frequency

C. wave number

D. angular wave number

Answer: D

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10. The equation of a progressive wave is given by y = 5 $\sin(100\pi t - 0.4\pi x)$ where y and x are in m and t is in s.

(1) The amplitude of the wave is 5 m.

(2) The wavelength of the wave is 5 m.

(3) The frequency of the wave is 50 Hz.

(4) The velocity of the wave is 250 m s^{-1}

Which of the following statements are correct?

A. (I), (2) and (3)

B. (2) and (3)

C. (1) and (4)

D. All are correct

Answer: D

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11. A progressive wave is represented by y = 5 $\sin(100\pi t - 2\pi x)$ where x and y are in m and t is in s. The maximum particle velocity is

A. $100\pi ms^{-1}$

B. $200\pi ms^{-1}$

C. $300\pi ms^{-1}$

D. $500\pi ms^{-1}$

Answer: D

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12. 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.

A. 3 cm

B. 4 cm

C. 5 cm

D. 7 cm

Answer: C

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13. Two identical sinusoidal waves each of amplitude 10 mm with a phase difference of 90° are travelling in the same direction in a string. The amplitude of the resultant wave is

A. 5 mm

B. $10\sqrt{2}$ mm

C. 15 mm

D. 20 mm

Answer: B

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14. For the travelling harmonic wave

$y(x, t) = 2 \cos 2\pi(10t - 0.008x + 0.35)$ where X and Y are in cm and t is in s. The phase difference between oscillatory motion of two points separated by distance of 0.5 m is

A. $0.2\pi rad$

B. $0.4\pi rad$

C. $0.6\pi rad$

D. $0.8\pi rad$

Answer: D

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15. Two waves are represented by the equations

$y_1 = a\sin(\omega t + kx + 0.57)m$ and

$y_2 = a\cos(\omega t + kx)$m,

where x is in metres and t is in seconds. The phase difference between them is

A. 1.0 radian

B. 1.25 radian

C. 1.57 radian

D. 0.57 radian

Answer: A

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16. The phase difference between oscillatory motion of two points separated by a distance of $\frac{\lambda}{2}$ is (where λ is the wavelength)

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

B. π

C. $\frac{3\pi}{2}$

D. 2π

Answer: B

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17. The equation of a wave is given by

$$y = 10\sin\left(\frac{2\pi}{45}t + \alpha\right)$$

If the displacement is 5 cm at t = 0, then the total phase at t = 7.5 s is

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

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

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

D. π

Answer: B

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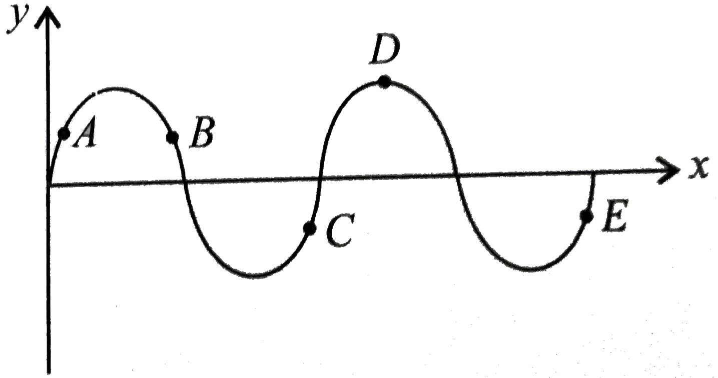
18. Figure shows a sinusoidal wave at a given instant.



Which points are in phase?

A. A,B

B. B,C

C. B,D

D. C,E

Answer: D

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19. The equation of a simple harmonic wave is given by $Y = 5\sin\frac{\pi}{2}(100t - x)$, where x and y are in metre and time is in second. The time period of the wave (m seconds) will be

A. 0.04

B. 0.01

C. 1

D. 5

Answer: A

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20. A wave travelling along the x-axis is described by the equation y (x, t) = 0.005 sin $(\alpha x - \beta t)$. If the wavelength and time period of the wave are 0.08 m and 2 s respectively, then α, β in appropriate units are

A. $\alpha = 25\pi, \beta = \pi$

B. $\alpha = \dfrac{0.08}{\pi}, \beta = \dfrac{2}{\pi}$

C. $\alpha = \dfrac{0.04}{\pi}, \beta = \dfrac{1}{\pi}$

D. $\alpha = 12.5\pi, \beta = \dfrac{\pi}{2}$

Answer: A

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21. Which of the following wave functions does not represent a travelling wave ?

A. $y = \tan(x - vt)^2$

B. $y = \log(x + vt)$

C. $y = \dfrac{1}{x + vt}$

D. All of these

Answer: D

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22. The equation of a progressive wave can be given by Y = 15 sin $(660\pi t - 0.02\pi x)$ cm. The frequency of the wave is

A. 330 Hz

B. 342 Hz

C. 365 Hz

D. 660 Hz

Answer: A

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23. The speed of transverse wave on a stretched string is

A. directly proportional to the tension in the string

B. directly proportional to the square root of the tension

C. inversely proportional to live

D. inversely proportional to sqyare of tension

Answer: B

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24. A sound is produced by plucking a string in a musical instrument, then

A. the velocity of the wave in the string is equal to the velocity of sound in the string

B. the frequency of wave in the string is equal to the frequency of the sound produced

C. the wave in the string is progrressive

D. the tension in the string varies from point to point

Answer: B

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25. Of the following properties of a wave, the one that is independent of the others is its :

A. Velocity

B. Frequency

C. Amplitude

D. Wavelength

Answer: C

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26. A transverse wave is represented by $y = A\sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?

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

B. πA

C. $2\pi A$

D. A

Answer: C

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27. A 10 m long steel wire has mass 5 g. If the wire is under a tension of 80 N, the speed of transverse waves on the wire is

A. $100ms^{-1}$

B. $200ms^{-1}$

C. $400ms^{-1}$

D. $500ms^{-1}$

Answer: C

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28. The transverse displacement of a string clamped at its both ends is given by $y(x, t) = 0.06\sin\left(\frac{2\pi}{3}x\right)\cos(l20\pi t)$ where x and y are in m and t in s. The length of the string is 1.5 m and its mass is 3×10^{-2} kg. The tension in the string is

A. 324 N

B. 648 N

C. 832 N

D. 972 N

Answer: B

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29. A transverse harmonic wave on a string is described by y(x, t) = 3sin (36t + 0.018x + π/4) where x and Y are in cm and t is in s. Which of the following statements is incorrect?

A. The waves is travelling in negative x-direction

B. The amplitude of the wave is 3 cm

C. The speed of the wave is $20ms^{-1}$

D. The frequency of the wave is $\frac{9}{\pi}$Hz.

Answer: D

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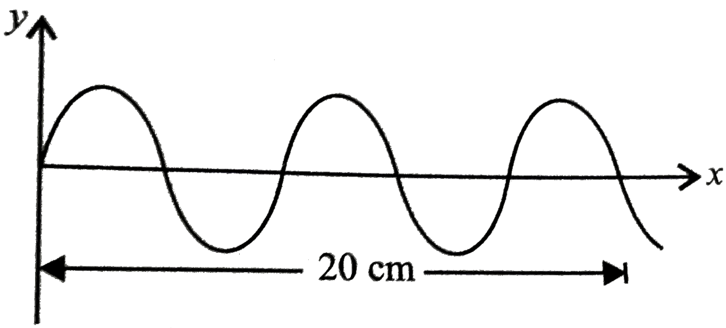
30. Figure given shows a sinusoidal wave on a string. If the frequency of the wave is 150 Hz, what is the velocity and wavelength of the given wave?



A. $0.04m, 10ms^{-1}$

B. $0.06m, 12ms^{-1}$

C. $0.08m, 10ms^{-1}$

D. $0.08m, 12ms^{-1}$

Answer: D

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31. Newton assumed that sound propagation in a gas takes under

A. isothemal condition

B. adiabatic condition

C. isobaric condition

D. isentropic condition

Answer: A

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32. According to Newton's formula, the speed of sound in air at STP is

(Take the mass of 1 mole of air is 29×10^{-3} kg)

A. $250ms^{-1}$

B. $260ms^{-1}$

C. $270ms^{-1}$

D. $280ms^{-1}$

Answer: D

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33. Out of the following gases under similar condition of temperature and pressure, the velocity of sound will be maximum in a) hydrogen b) nitrogen c) oxygen d) chlorine

A. hydrogen

B. nitrogen

C. oxygen

D. chlorine

Answer: A

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34. Speed of sound waves in a fluid depends

A. directly proportional to the square root of bulk modulus of the medium.

B. inversely proportional to the bulk modulus of the medium.

C. directly proportional to the density of the medium

D. inversely proportional to the density of the medium

Answer: A

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35. If v_{rms} is the rms speed of molecules in a gas and v is the speed of sound waves in the gas, then the ratio $\frac{v_{rms}}{v}$ is

A. $\sqrt{\frac{3}{\gamma}}$

B. $\sqrt{\frac{\gamma}{3}}$

C. $\sqrt{3\gamma}$

D. $\frac{\sqrt{3}}{\gamma}$

Answer: A

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36. At what temperature will the speed of sound in air be 3 times its value at 0° C?

A. $1184^\circ C$

B. $1148^\circ C$

C. $2184^\circ C$

D. $2148^\circ C$

Answer: C

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37. If the bulk modulus of water is 2100 M Pa, what is the speed of sound in water ?

A. $1450ms^{-1}$

B. $2100ms^{-1}$

C. $1400ms^{-1}$

D. $1200ms^{-1}$

Answer: A

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38. The ratio of the velocity of sound in Hydrogen gas $\left(\gamma = \frac{7}{5}\right)$ to that in Helium gas $\left(\gamma = \frac{5}{3}\right)$ at the same temperature is $\sqrt{\frac{21}{3}}$.

A. $\sqrt{\frac{5}{42}}$

B. $\sqrt{\frac{5}{21}}$

C. $\frac{\sqrt{42}}{5}$

D. $\frac{\sqrt{21}}{5}$

Answer: C

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39. Velocity of sound in vacuum is

A. zero

B. $330ms^{-1}$

C. $360ms^{-1}$

D. $660ms^{-1}$

Answer: A

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40. The relation between frequency 'n' wavelength $'\lambda'$ and velocity of propagation 'v' of wave is

A. $v = \frac{\lambda}{v}$

B. $v = \lambda v$

C. $v = \frac{v}{\lambda}$

D. None of these

Answer: C

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41. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating freqency of the scanner is 3.2 MHz. The speed of sound in a tissue is 1.6 km s^{-1}. The wavelength of sound in the tissue is a) 0.25 mm b) 0.5 mm c) 0.75 mm d) 1 mm

A. 0.25 mm

B. 0.5 mm

C. 0.75 mm

D. 1 mm

Answer: B

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42. A body sends waves 100mm long through medium A and 0.25m long in medium B. If the velocity of waves in medium A is $80cms^{-1}$, calculate the velocity of waves in medium B. a) 1 m/s b) 2 m/s c) 3 m/s d) 4 m/s

A. $1ms^{-1}$

B. $2ms^{-1}$

C. $3ms^{-1}$

D. $4ms^{-1}$

Answer: B

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43. Sounds waves travel at $350m/s$ through a warm air and at $3500m/s$ through brass. The wavelength of a $700Hz$. Acoustic wave as it enters brass from warm air

A. decreases by a factor 10

B. increases by a factor 10

C. increases by a factor 10

D. decreases by a factor 20

Answer: C

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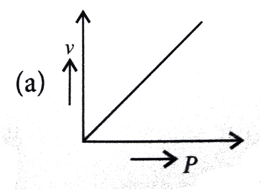
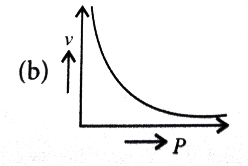
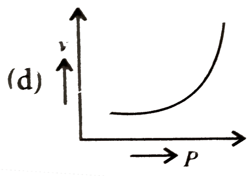
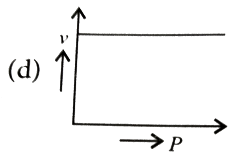
44. A student plotted the following four graphs representing the variation of velocity of sound in a gas with the pressure P. Whic one is correct?

A. 

B. 

C. 

D. 

Answer: D

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45. 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 km s^{-1}, and that of P wave is 8.0 kms^{-1}. A seismograph records P and S waved from an earthquake. The first P wave arrives 4 min before the first S wave. Assuming the waves travel in straight line, how far away does the earthquake occur?

A. 192 km

B. 384 km

C. 1920 km

D. 3840 km

Answer: C

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46. A travelling wave represented by

$y = A\sin(\omega t - kx)$

is superimposed on another wave represented by

$y = A\sin(\omega t + kx)$. The resultant is

A. standing wave having nodes at x= $\left(n + \frac{1}{2}\right)\frac{\lambda}{2}$, n=0,1,2,â€¦.

B. satnding wave having nodes at $x = \frac{n\lambda}{2}$,n=0,1,2..

C. wave travelling along +x direction

D. wave travelling along-x direction

Answer: B

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47. The stationary wave y = 2a sinkx cosωt in a stretched string is the result of superposition of $y_1 = a\sin(kx - \omega t)$ and

A. $y_2 = a\cos(kx + \omega t)$

B. $y_2 = a\sin(kx + \omega t)$

C. $y_2 = a\cos(kx - \omega t)$

D. $y_2 = a\sin(kx - \omega t)$

Answer: B

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48. When sound wave is refracted from air to water, which of the following will remain unchanged?

A. Wavelength

B. Wave number

C. wave velocity

D. Frequency

Answer: D

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49. The phenomenon of echo is an example of

A. reflection

B. refraction

C. beat

D. resonance

Answer: A

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50. A pulse of a wavetrain travels along a stretched string and reaches the fixed end of the string. It will be reflected back with

A. a phase change of 180° with velocity reversed.

B. the same phase as the incident pulse with no reversal of velocity

C. a phase change of 180° with no reversal of velocity.

D. the same phase as the incident pulse but with velocity reversed.

Answer: A

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51. In case of a travelling wave, the reflection at a rigid boundary will take place with a phase change of

A. $\frac{\pi}{2}$ radian

B. $\frac{\pi}{4}$ radian

C. $\frac{\pi}{6}$ radian

D. π radian

Answer: D

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52. A man standing between two parallel hills, claps his hand and hears successive echoes at regular intervals of 1s. If velocity of sound is 340 m s^{-1}, then the distance between the hills is

A. 100 m

B. 170 m

C. 510 m

D. 340 m

Answer: C

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53. A stone is dropped into a pond from the top of the tower of height h. If v is the speed of sound in air, then the sound of splash will be heard at the top of the tower after a time

A. $\sqrt{\frac{2h}{g}}+\frac{h}{v}$

B. $\sqrt{\frac{2h}{g}}-\frac{h}{v}$

C. $\sqrt{\frac{2h}{g}}$

D. $\sqrt{\frac{2h}{g}}+\frac{2h}{v}$

Answer: A

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54. A bat emits ultrasonic sound of frequency 100 kHz in air. If this sound meets a water surface, the wavelengths of the reflected and transmitted sound are (Speed of sound in air = 340 m s^{-1} and in water = 1500 m s^{-1})

A. 3.4 mm, 30 mm

B. 6.8 mm, 15 mm

C. 3.4 mm, 15 mm

D. 6.8 mm, 30 mm

Answer: C

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55. In a stationary longitudinal wave, nodes are points of

A. minimum displacement and minimum pressure change.

B. minimum displacement and maximum pressure change

C. maximum displacement and maximum pressure change

D. maximum displacement and minimum pressure change.

Answer: B

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56. Which of the following statements is correct?

A. The distance between any two consecutive antinodes or nodes is $\frac{\lambda}{4}$

B. The distance between a node and adjoining antinode is $\frac{\lambda}{4}$

C. In the open end is an node.

D. In the closed end is an antinode.

Answer: B

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57. In an organ pipe of length L open at both ends, the fundamental mode has a frequency (where v is a speed of sound in air)

A. $\frac{v}{2L}$ and only odd harmonies are present.

B. $\frac{v}{2L}$ and only even harmonies are present.

C. $\frac{v}{2L}$ and all harmonies are present.

D. $\frac{v}{4L}$ and only odd harmonies are present.

Answer: C

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58. The transverse displacement of a string clamped at its both ends is given by

$$y(x, t) = 2\sin\left(\frac{2\pi}{3}x\right)\cos(100\pi t)$$

where x and y are in cm and t is in s.

Which of the following statements is correct?

A. All the points on the string between two consecutive nodes vibrate with same frequency, phase and amplitude.

B. All the points on the string between two consecutive nodes vibrate with same frequency and phase but different amplitude.

C. All the points on the string between two consecutive nodes vibrate with different frequency and phase but same amplitude.

D. All the points on the string between two consecutive nodes vibrate with different frequency, phase and amplitude

Answer: B

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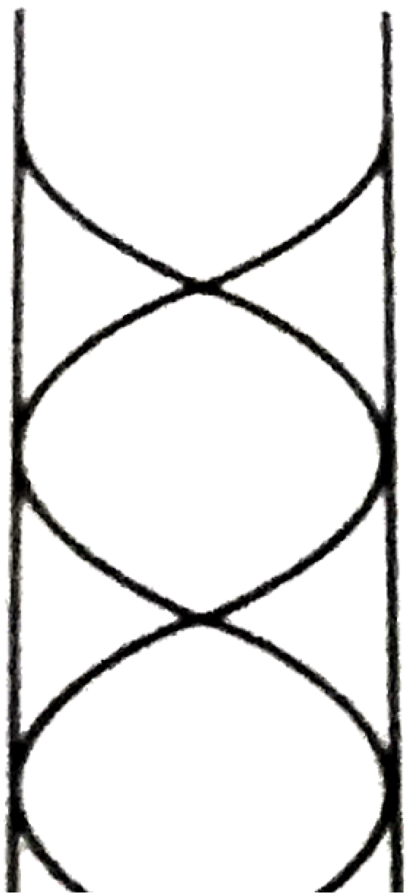
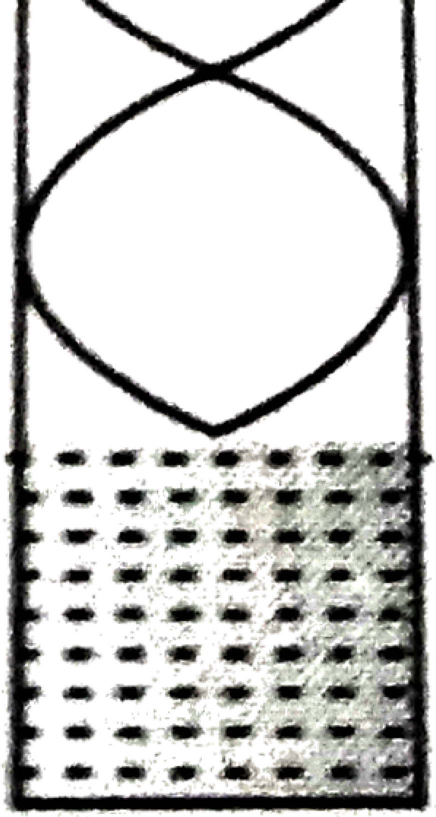
59. One of the modes of resonance in a tube containing water at one end has been shown. The tube in the present case is in





A. first harmonic

B. third harmonic

C. fifth harmonic

D. seventh harmonic

Answer: D

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60. Two open organs pipes of fundamental frequencies v_1 and v_2 are joined in series. The fundamental frequency of the new pipe so obtained will be

A. $v_1 + v_2$

B. $\dfrac{v_1 v_2}{(v_1 + v_2)}$

C. $\dfrac{v_1 v_2}{v_1 + v_2}$

D. $\sqrt{(v_1^2 + v_2^2)}$

Answer: B

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61. A second harmonic has to be generated in a string of length l stretched between two rigid supports. The point where the string has to be plucked and touched are

A. Plucked at $\dfrac{L}{4}$ and touch at $\dfrac{L}{2}$

B. Plucked at $\frac{L}{4}$ and touch at $\frac{3L}{2}$

C. Plucked at $\frac{L}{2}$ and touch at $\frac{L}{2}$

D. Plucked at $\frac{L}{2}$ and touch at $\frac{3L}{4}$

Answer: A

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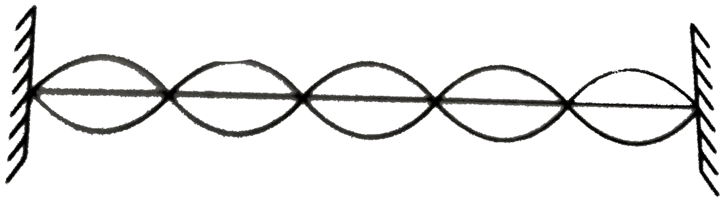
62. A string fixed at its both ends vibrates in 5 loops as shown in the figure. The total number of nodes and antinodes are respectively



A. 5,6

B. 6,5

C. 7,4

D. 4,7

Answer: B

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63. Which of the following statements is incorrect 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: C

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64. The fundamental note produced by a closed organ pipe is of frequency v. The fundamental note produced by an open organ pipe of same length will be of frequency

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

B. v

C. $2v$

D. $4v$

Answer: C

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65. A steel rod of length 100 cm is clamped at the middle. The frequency of the fundamental mode for the longitudinal vibrations of the rod is (Speed of sound in steel = 5 km s^{-1}) a) 1.5 KHz b) 2 KHz c) 2.5 KHz d) 3 KHz

A. 1.5 KHz

B. 2 KHz

C. 2.5 KHz

D. 3 KHz

Answer: C

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66. A pipe 30 cm long, is open at both ends. Which harmonic mode of the pipe resonates a 1.1 kHz source? (Speed of sound in air = 330 m s^{-1}) a) First b) Third c) Second d) Fourth

A. First

B. Third

C. Second

D. Fourth

Answer: B

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67. The frequency of tuning fork is 256 Hz. It will not resonate with a fork of frequency

A. 768 Hz

B. 738 Hz

C. 512 Hz

D. 256 Hz

Answer: B

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68. When a string fixed at its both ends vibrates in 1 loop, 2 loops, 3 loops and 4 loops, the frequencies are in the ratio

A. 1 : 1 : 1 : 1

B. 1 : 2 : 3 : 4

C. 4 : 3 : 2 : 1

D. 1 : 4 : 9 : 16

Answer: B

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69. A pipe 17 cm long is closed at one end. Which harmonic mode of the pipe resonates a 1.5 kHz source? (Speed of sound in air = 340 m s^{-1})

A. First

B. Third

C. Fifth

D. Seventh

Answer: B

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70. A resonance air column shows resonance with a tuning fork of frequency 256 Hz at column lengths 33.4 cmand 101.8 cm. find (i) end-correction and (ii) the speed of sound in air.

A. 1. $300ms^{-1}$

B. 2. $250ms^{-1}$

C. 3. $390ms^{-1}$

D. 4. $350ms^{-1}$

Answer: D

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71. A wire is stretched between two rigid supports vibrates in its fundamental mode with a frequency of 50 Hz. The mass of the wire is 30 g and its linear density is 4×10^{-2} kg m s^{-1}. The speed of the transverse wave at the string is

A. $25ms^{-1}$

B. $50ms^{-1}$

C. $75ms^{-1}$

D. $100ms^{-1}$

Answer: C

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72. A guitar string is 90 cm long and has a fundamental frequency of 124 Hz. Where should it be pressed to produce a fundamatal frequecy of 186 Hz?

A. 60 cm

B. 30 cm

C. 20 cm

D. 10 cm

Answer: A

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73. A stretched wire emits a fundamental note of2 56 Hz. Keeping the stretching force constant and reducing the length of wire by 10 cm, the frequency becomes 320 Hz, the original length of the wire is

A. 100 cm

B. 50 cm

C. 400 cm

D. 200 cm

Answer: B

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74. A tuning fork of frequency 440 Hz resonates with a tube closed at one end of length 18 cm and diameter 5 cm in fundamental mode. The velocity of sound in air is

A. 1. $336ms^{-1}$

B. 2. $343ms^{-1}$

C. 3. $300ms^{-1}$

D. 4. $350ms^{-1}$

Answer: B

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75. Two pipes are each 50 cm in length. One of them is closed at one end while the other is open at both ends. The speed of sound in air is 340 m s^{-1}. The frequency at which both the pipes can resonate is

A. 1. 680 Hz

B. 2. 510 Hz

C. 3. 85 Hz

D. 4. None of these

Answer: D

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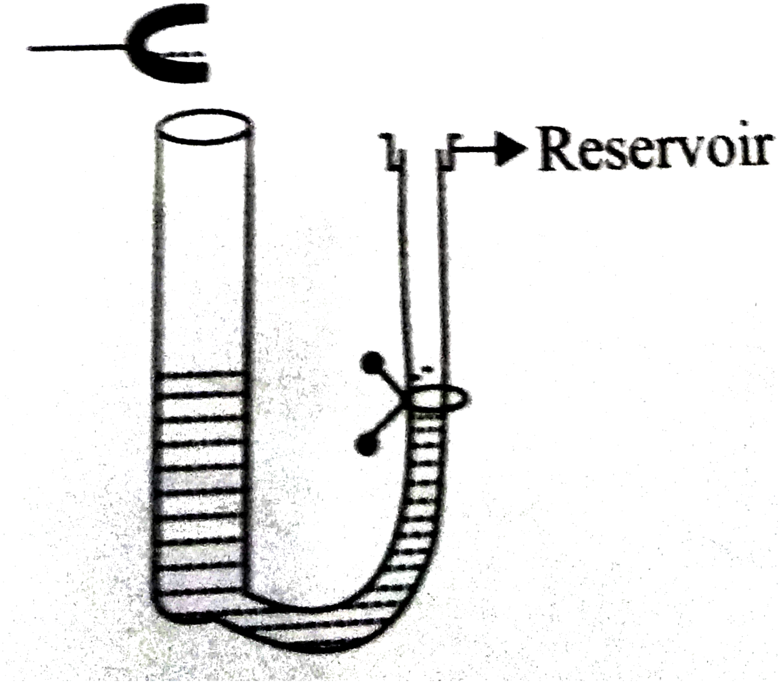
76. A tuning fork vibrating with a frequency of 500 Hz is kept close to the open end of a tube filled with water, as shown in figure. The water level in the tube is gradually lowered When the water level is 17 cm below the open to open end, maximum intensity of sound is heard. If the room temperature is 20° C, the speed of sound in air at the temperature is



A. 1. $330ms^{-1}$

B. 2. $340ms^{-1}$

C. 3. $350ms^{-1}$

D. 4. $360ms^{-1}$

Answer: B

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77. String A has a length L, radius of cross-section r, density of material p and is under tension T. String B has all these quantities double those of string A. If v_a and v_b are the corresponding fundamentals frequencies of the vibrating string,then

A. 1. $v_A = 2v_B$

B. 2. $v_A = 4v_B$

C. 3. $v_B = 4v_A$

D. 4. $v_A = v_B$

Answer: B

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78. A glass tube of $1.0m$ length is filled with water . The water can be drained out slowly at the bottom of the tube . If a vibrating tuning fork of frequency $500Hz$ is brought at the upper end of the tube and the velocity of sound is $300m/s$, then the total number of resonances obtained will be

A. A. 4

B. B. 3

C. C. 2

D. 4. 1

Answer: B

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79. Which of the following phenomenon is used by the musicians to tune their musical instruments?

A. Interferance

B. Diffraction

C. Beats

D. Polarisation

Answer: C

Watch Video Solution

80. The phenomenon of beats can take place

A. for longitudinal and transverse waves

B. for transverse wave only

C. for sound waves only

D. for both longitudinal and transverse waves

Answer: D

Watch Video Solution

81. When two waves of almost equal frequencies v_1 and v_2 reach at a point simultaneously, the time interval between successive maxima is

A. $v_1 + v_2$

B. $v_1 - v_2$

C. $\frac{1}{v_1 + v_2}$

D. $\frac{1}{v_1 - v_2}$

Answer: D

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82. When two sound sources of the same amplitude but of slightly different frequencies v_1 and v_2 are sounded simultaneously, the sound one hears has a frequency equal to

A. $|v_1 - v_2|$

B. $\left|\frac{v_1 - v_2}{2}\right|$

C. $\sqrt{v_1 v_2}$

D. $|v_1 + v_2|$

Answer: B

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83. A and B are two wires whose fundamental frequencies are 256 and 382 Hz respectively. How many beats in 2 seconds will be heard by the third harmonic of A and second harmonic of B?

A. 4

B. 8

C. 16

D. zero

Answer: B

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84. Two tuning forks, A and B, produce notes of frequencies 258 Hz and 262 Hz. An unknown note sounded with A produces certain beats. When the same note is sounded with B, the beat frequency gets doubled. The unknown frequency is

A. 250 Hz

B. 252 Hz

C. 254 Hz

D. 256 Hz

Answer: C

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85. 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 tuning fork B when not loaded? a) 502 Hz b) 507 Hz c) 517 Hz d) 522 Hz

A. 502 Hz

B. 507 Hz

C. 517 Hz

D. 522 Hz

Answer: C

Watch Video Solution

86. Two sitar strings A and B are slightly out of tune and produce beats of frequency 5 Hz. When the tension in the string B is slightly increased, the beat frequency is found to reduce to 3 Hz. If the frequency of string A is 427 Hz, the original frequency of string B is

A. 422 Hz

B. 424 Hz

C. 430 Hz

D. 432 Hz

Answer: A

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87. A sound wave travels with a velocity of 300 m s^{-1} through a gas. 9 beats are produced in 3 s when two waves pass through it simultaneously. If one of the waves has 2 m wavelength, the wavelength of the other wave is a) 1.98 m b) 2.04 m c) 2.06 m d) 1.99 m

A. 1.98 m

B. 2.04 m

C. 2.06 m

D. 1.99 m

Answer: B

Watch Video Solution

88. A closed organ pipe and an open organ pipe of same length produce 2 beats/second while vibrating in their fundamental modes. The length of the open organ pipe is halved and that of closed pipe is doubled. Then, the number of beats produced per second while vibrating in the fundamental mode is

A. 2

B. 6

C. 8

D. 7

Answer: D

Watch Video Solution

89. There are 26 tuning forks arranged in the decreasing order of their frequencies. Each tuning fork gives 3 beats with the next. The first one is octave of the last. What is the frequency of 18th tuning fork ?

A. 100 Hz

B. 99 Hz

C. 96 Hz

D. 103 Hz

Answer: B

Watch Video Solution

90. Two turning forks of frequencies n_1 and n_2 produces n beats per second. If n_2 and n are known, n_1 may be given by

A. $\frac{n_2}{n}+n_2$

B. $n_2 n$

C. $n_2 \pm n$

D. $\frac{n_2}{n} - n_2$

Answer: C

Watch Video Solution

91. Doppler effect is applicable for a) sound waves only b) light waves only c) both sound and light waves d) None of these

A. sound waves only

B. light waves only

C. both sound and light waves

D. None of these

Answer: C

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92. Match the Column I with Column II

	Column I		Column II
(A)	Change in apparent frequency due to the relative motion between source and listener is	(p)	Beats
(B)	Intensity of sound varies with time in	(q)	Transverse wave
(C)	Sound waves in air are	(r)	Doppler's effect
(D)	Light waves are	(s)	Longitudinal wave

A. A-p, B - q, C- r, D - s

B. A q, B - r, C - s, D - p

C. A - r, B - p, C-s, D - q

D. A - r, B s, C - p, D - q

Answer: C

Watch Video Solution

93. 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 30 ms^{-1} towards the platform. The frequency of the sound heard by an observer standing on the platform is

(Speed of sound in air = 330 m s^{-1})

A. 420 Hz

B. 430 Hz

C. 440 Hz

D. 450 Hz

Answer: C

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94. A train, standing in a station yard, blows a whistle of frequency 400Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of 10m//s. Given that the speed sound in still air is $340m / s$,

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 330 ms^{-1}

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

Answer: A

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95. A train moving at a speed of $220 ms^{-1}$ towards a stationary object emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is (speed of sound in air is $330 ms^{-1}$)

A. 3500 Hz

B. 4000 Hz

C. 5000 Hz

D. 3000 Hz

Answer: C

Watch Video Solution

96. A train approaching a railway platform with a speed of 20 m s^{-1} starts blowing the whistle. Speed of sound in air is 340 ms^{-1}. If the frequency of the emitted sound from the whistle is 640 Hz, the frequency of sound as heard by person standing on the platform

A. 600 Hz

B. 640 Hz

C. 680 Hz

D. 720 Hz

Answer: C

Watch Video Solution

97. An observer moves towards a stationary source of sound. The percentage change in the apparent frequency is

A. zero

B. 0.05

C. 0.1

D. 0.2

Answer: D

Watch Video Solution

98. A source of sound producing wavelength 50 cm is moving away from a stationary observer with $\left(\frac{1}{5}\right)^{th}$ speed of sound. Then what is the wavelength of sound received by the observer?

A. 55 cm

B. 40 cm

C. 60 cm

D. 70 cm

Answer: C

Watch Video Solution

99. A policeman blows a whistle with a frequency of 500 Hz.A car approaches him with a velocity of $15ms^{-1}$.Calculate the change in frequency as heard by the driver of the car as he passes the policeman. Speed of sound in air is $300ms^{-1}$. a) 25 Hz b) 50 Hz c) 100 Hz d) 150 Hz

A. 25 Hz

B. 50 Hz

C. 100 Hz

D. 150 Hz

Answer: B

Watch Video Solution

100. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an expression for the beat frequency heard by the motorist.

A. $\left(\dfrac{v+v_m}{v+v_b}v\right.$

B. $\dfrac{v+v_m}{v-v_b}v$

C. $\left(2v_b\dfrac{v+v_m}{v^2-v_b^2}v\right.$

D. $\left(2v_m\dfrac{v+v_b}{v^2-v_m^2}v\right.$

Answer: C

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Hots

1. One end of a taut string of length $3m$ along the x-axis is fixed at $x = 0$. The speed of the waves in the string is $100ms^{-1}$. The other end of the string is vibrating in the y-direction so that stationary waves are set up in the string. The possible wavelength(s) of these sationary waves is (are)

A. $y(t) = A\frac{\sin(2\pi x)}{6}\frac{\cos(50\pi t)}{3}$

B. $y(t) = A\frac{\sin(\pi x)}{3}\frac{\cos(100\pi t)}{3}$

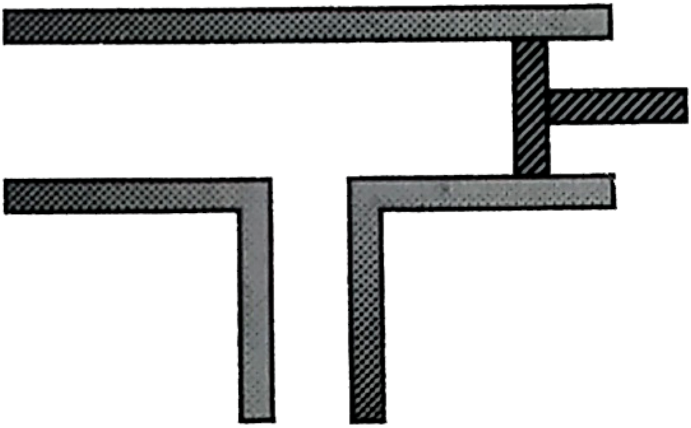
C. $y(t)=A\frac{\sin(5\pi x)}{6}\frac{\cos(255\pi t)}{3}$

D. $y(t)=A\frac{\sin(5\pi x)}{2}\cos 250\pi t$

Answer: D

Watch Video Solution

2. Vibrating tuning fork of frequency n is placed near the open end of a long cylindrical tube. The tube has a side opening and is fitted with a movable reflecting piston. As the piston is moved through $8.75cm$, the intensity of sound changes from a maximum to minimum. If the speed of sound is $350m/s$. Then n is



A. 500 Hz

B. 1000 Hz

C. 2000 Hz

D. 4000 Hz

Answer: B

Watch Video Solution

Watch Video Solution

3. Three travelling waves are superimposed. The equations of the wave are

$y_! = A_0 \sin(kx - \omega t)$, $y_2 = 3\sqrt{2}A_0 \sin(kx - \omega t + \phi)$

and $y_3 = 4A_0 \cos(kx - \omega t)$

find the value of $\phi(\text{given } 0 \le \phi \le \pi/2)$ if the phase difference between the resultant wave and first wave is $\pi/4$

A. $\frac{\pi}{6}$

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

C. $\frac{\pi}{12}$

D. None of these

Answer: C

Watch Video Solution

4. Find the temperature at which the fundamental frequency of an organ pipe is independent of small variation in temperature in terms of the coefficient of linear expansion (α) of the material of the tube.

A. $1/3\alpha$

B. $1/2\alpha$

C. $1/4\alpha$

D. $1/5\alpha$

Answer: B

Watch Video Solution

5. An organ pipe of cross-sectional area 100 cm^2 resonates with a tuning fork of frequency 1000 Hz in fundamental tone. The minimum volume of water to be drained so the pipe again resonates with the same tuning fork is

(Take velocity of wave = 320 m s^{-1})

A. $800 cm^3$

B. $1200 cm^3$

C. $1600 cm^3$

D. $2000 cm^3$

Answer: C

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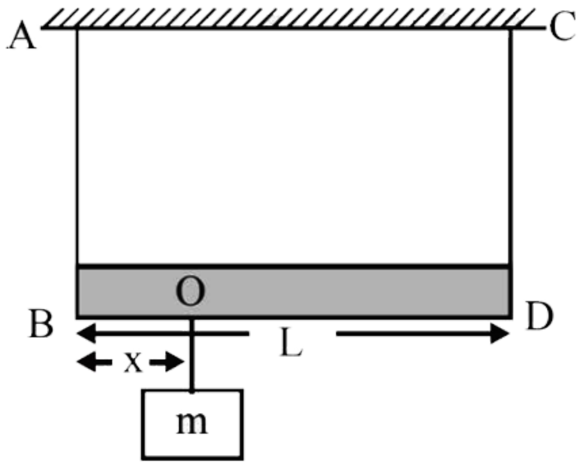
6. A massless rod of length L is suspened by two identical string AB and CD of equal length. A block of mass m is suspended from point O such that BO is equal to 'x'. Further it is observed that the frequency of $1st$ harmonic in AB is equal to $2nd$ harmonic frequency in CD. 'x' is



A. $\frac{L}{5}$

B. $\frac{4L}{5}$

C. $\frac{3L}{4}$

D. $\frac{L}{4}$

Answer: A

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7. A stationary source is emitting sound at a fixed frequency f_0, which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected from the cars is 1.2% of f_0. What is the difference in the speeds of the cars (in km per hour) to the nearest integer ? The cars are moving at constant speeds much smaller than the speed of sound which is $330ms^{-1}$

.

A. 2

B. 3

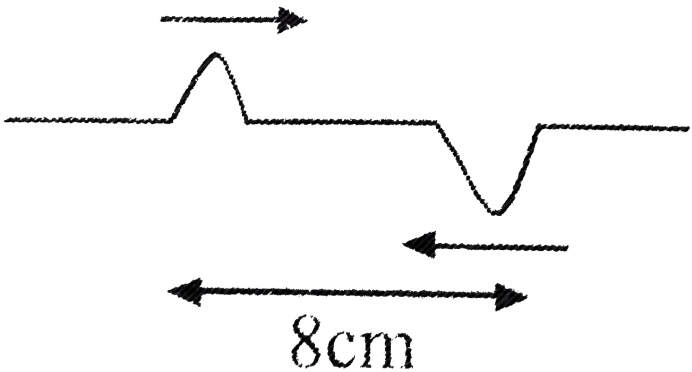
C. 5

D. 7

Answer: D

Watch Video Solution

8. Two pulses in a stretched string whose centres are initially 8 cm apart are moving towards each other as shown in the figure. The speed of each pulse is 2 cm/s. After 2 second, the total energy of the pulses will be



A. zero

B. purely kinetic

C. purely potential

D. partly kinetic and partly potential

Answer: B

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Exempler

1. The 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

A. neither longitudinal nor transverse

B. both longitudinal and transverse

C. only longitudinal

D. only transverse.

Answer: B

Watch Video Solution

2. Sound waves of wavelength α travelling in a medium with a speed of v m s^{-1} enter into another medium where its speed is 2v m s^{-1}. Wavelength of sound waves in the second medium is

A. λ

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

C. 2λ

D. 4λ

Answer: C

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3. Speed of sound waves in air a) is independent of temperature b) increases with pressure c) increases with increase in humidity d) decreases with increase in humidity.

A. is independent of temperature

B. increases with pressure

C. increases with increase in humidity

D. decreases with increase in humidity.

Answer: C

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4. 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

A. frequency of sound waves

B. amplitude of sound waves

C. wavelength of sound waves.

D. loudness of sound waves

Answer: C

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5. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are a) matter b) energy c) energy and matter d) energy, matter and momentum

A. matter

B. energy

C. energy and matter

D. energy, matter and momentum

Answer: B

Watch Video Solution

6. Which of the following statements are true wave motion? a) Mechanical transverse waves can propagate through all mediums. b) Longitudinal waves can propagate through solids only c)

Mechanical transverse waves can propagate through only d) Longitudinal waves can propagate through vacuum.

A. Mechanical transverse waves can propagate through all mediums.
B. Longitudinal waves can propagate through solids only
C. Mechanical transverse waves can propagate through only
D. Longitudinal waves can propagate through vacuum.

Answer: C

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7. A sound wave is passing through air column in the form of compression and rerefactions. In consecutive compressions and rerefactions.

A. density remains constant

B. Boyles law is obeyed

C. bulk modulus of air oscillates

D. there is no transfer of heat.

Answer: D

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8. 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 amplitude 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: B

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9. A string of mass 2.50kg is under a tension os 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?

A. one second

B. 0.5 second

C. 2 second

D. data given is insufficent

Answer: B

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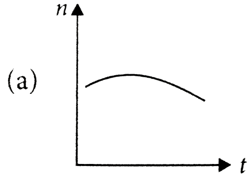
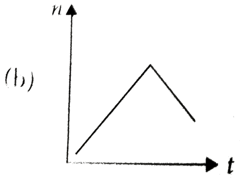
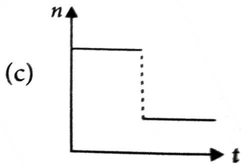
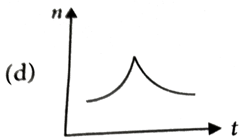
10. A train whistling at constant frequency is moving towards a station at a constant speed V. The train goes past a stationary observer on the station. The frequency n' of the sound as heard by the observer is plotted as a function of time t, figure. Identify the expected curve.

A. 

B. 

C. 

D. 

Answer: C

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Assertion

1. Assertion : A wave is motion of matter as a whole in a medium.

Reason : Wind is same as sound wave in air.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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2. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are

A. Energy, momentum and mass

B. Energy

C. Energy and mass

D. Energy and linear momentum

Answer: C

Watch Video Solution

3. S_1: Source and observer both are stationary and wind is blowing in a direction from source to observer then observer detects an apparent increase in frequency.

S_2: Beat frequency is defined as the difference of frequency of two sources.

S_3: Pressure node is always a displacement node and pressure antinode is always a displacement antinode.

A. If both assertion and reason are true and reason is the correct explanation of assertion.
B. If both assertion and reason are true but reason is not the correct explanation of assertion.
C. If assertion is true but reason is false.
D. If both assertion and reason are false.

Answer: B

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4. Assertion: The change in air pressure effects the speed of sound.

Reason: The speed of sound in gases is proportional to the square of pressure.

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

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Assertion : The speed of soun in solids is maximum though density is large.

Reason : The coefficient of elasticity of solid is large.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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6. Assertion : Speed of mechanical wave in the medium depends on the velocity of source, relative to an observer at rest.

Reason : Speed of mechanical wave is independent of the elastic and other properties such as mass density of the medium.

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

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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7. Assertion : The basic of Laplace correction was that, exchange of heat between the region of compression and rarefaction in air is not possible.

Reason : Air is a bad conductor of heat and velocity of soundin air is large.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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8. 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. 1. increase

B. 2. decrease

C. 3. remains constant

D. 4. becomes zero

Answer: A

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9. Statement-1: On reflection from a rigid boudnary (denser medium), there is a complete reversal of phase

Statement-2: This is because on reflection is a denser medium, both the particle velocity and wave velocity are reversed in sign.

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

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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10. In standing waves, select incorrect

A. All particle between two consecutive nodes vibrate in same phase

B. Particles on opposite side of a node vibrate in same phase

C. Frequency of oscillation of all particles (except nodes) is same

D. Formation of standing waves is a special type of interference phenomana.

Answer: D

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11. Assertion : The interference of two identical waves moving in same direction produces standing waves.

Reason : Various elements of standing waves do not remain in constant phase.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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12. Assertion: The fundamental frequency of an open organ pipe increases as the temperature is increased.

Reason: As the temperature increases, the velocity of sound increases more rapidly than length of the pipe.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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13. Assertion : The sound emitted by the source travels in all directions.

Reason : The relative velocity of sound with respect to the observer is the sum of velocity of sound and velocity of observer.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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14. When a source of sound passes us, whether it be a car horn or a train whistle, the pitch we hear goes from high to low. Explain why. Use any relation to support your explanation.

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15. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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Introduction

1. The produced rays in sonography are

A. Radio waves

B. X-rays

C. Ultrasonic waves

D. Gamma rays

Answer: C

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2. Which of the following wave does not travel in vaccum ?

A. Seismic waves

B. X-rays

C. Light

D. Radio waves

Answer: A

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Transverse And Longitudinal Waves

1. In a transverse wave, the particles of the medium

A. vibrate in a direction perpendicular to the direction of the propagation.

B. vibrate in a direction parallel to the direction or of the propagation

C. move in circle

D. move in ellipse

Answer: A

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2. A transverse wave consists of

A. only crests

B. only troughs

C. both crests and troughs

D. rarefactions and compressions

Answer: C

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3. Ultrasonic waves produced by a vibrating quartz crystal are

A. only longitudinal

B. only transverse

C. both longitudinal and transverse

D. neither longitudinal nor transverse

Answer: A

Watch Video Solution

4. The sound waves travel fastest:

A. solids

B. liquids

C. gases

D. vacuum

Answer: A

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5. Sound wave in air cannot be polarised because

A. their speed is small

B. they require medium

C. these are longitudinal

D. their speed is temperature dependent

Answer: C

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Displacement Relation In A Progressive Wave

1. During propagation of a plane progressive mechanical wave,

A. All the particles are vibrating in the same phase.

B. Amplitude of all the particles is equal.

C. Particles of the medium executes SHM

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

Answer: A

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2. The propagation constant of a wave is also calle its

A. wavelength

B. frequency

C. wave number

D. angular wave number

Answer: D

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3. The equation of a progressive wave is given by y = 5 $\sin(100\pi t - 0.4\pi x)$ where y and x are in m and t is in s.

(1) The amplitude of the wave is 5 m.

(2) The wavelength of the wave is 5 m.

(3) The frequency of the wave is 50 Hz.

(4) The velocity of the wave is 250 m s^{-1}

Which of the following statements are correct?

A. (I), (2) and (3)

B. (2) and (3)

C. (1) and (4)

D. All are correct

Answer: D

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4. A progressive wave is represented by y = 5 $\sin(100\pi t - 2\pi x)$ where x and y are in m and t is in s. The maximum particle velocity is

A. $100\pi ms^{-1}$

B. $200\pi ms^{-1}$

C. $300\pi ms^{-1}$

D. $500\pi ms^{-1}$

Answer: D

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5. 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.

A. 3 cm

B. 4 cm

C. 5 cm

D. 7 cm

Answer: C

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6. Two identical sinusoidal waves each of amplitude 10 mm with a phase difference of 90° are travelling in the same direction in a string. The amplitude of the resultant wave is

A. 5 mm

B. $10\sqrt{2}$ mm

C. 15 mm

D. 20 mm

Answer: B

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7. For the travelling harmonic wave

y(x, t) = 2 cos2π(10t - 0.008x + 0.35) where X and Y

are in cm and t is in s. The phase difference between oscillatory motion of two points separated by distance of 0.5 m is

A. $0.2\pi rad$

B. $0.4\pi rad$

C. $0.6\pi rad$

D. $0.8\pi rad$

Answer: D

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8. Two waves are represented by the equations

$y_1 = a\sin(\omega t + kx + 0.57)m$ and

$y_2 = a\cos(\omega t + kx)$m,

where x is in metres and t is in seconds. The phase difference between them is

A. 1.0 radian

B. 1.25 radian

C. 1.57 radian

D. 0.57 radian

Answer: A

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9. The phase difference between oscillatory motion of two points separated by a distance of $\frac{\lambda}{2}$ is (where λ is the wavelength)

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

B. π

C. $\frac{3\pi}{2}$

D. 2π

Answer: B

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10. The equation of a wave is given by

$$y = 10\sin\left(\frac{2\pi}{45}t + \alpha\right)$$

If the displacement is 5 cm at t = 0, then the total phase at t = 7.5 s is

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

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

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

D. π

Answer: B

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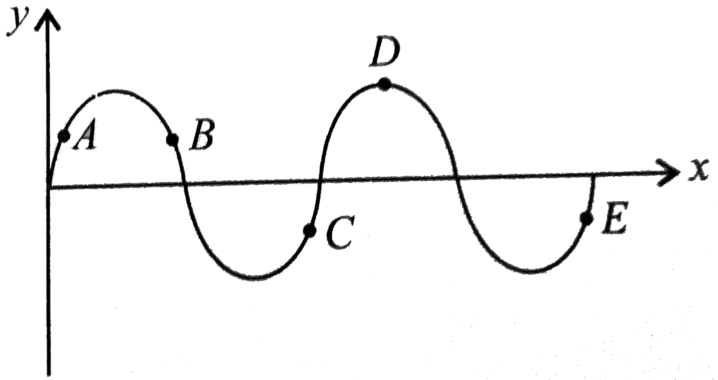
11. Figure shows a sinusoidal wave at a given instant.



Which points are in phase?

A. A,B

B. B,C

C. B,D

D. C,E

Answer: D

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12. The equation of a simple harmonic wave is given by $Y = 5 \sin \frac{\pi}{2}(100t - x)$, where x and y are in metre and time is in second. The time period of the wave (m seconds) will be

A. 0.04

B. 0.01

C. 1

D. 5

Answer: A

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13. A wave travelling along the x-axis is described by the equation y (x, t) = 0.005 sin $(\alpha x - \beta t)$. If the wavelength and time period of the wave are 0.08 m and 2 s respectively, then α, β in appropriate units are

A. $\alpha = 25\pi, \beta = \pi$

B. $\alpha = \frac{0.08}{\pi}, \beta = \frac{2}{\pi}$

C. $\alpha = \frac{0.04}{\pi}, \beta = \frac{1}{\pi}$

D. $\alpha = 12.5\pi, \beta = \frac{\pi}{2}$

Answer: A

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14. Which of the following wave functions does not represent a travelling wave ?

A. $y = \tan(x - vt)^2$

B. $y = \log(x + vt)$

C. $y = \frac{1}{x + vt}$

D. All of these

Answer: D

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15. The equation of a progressive wave can be given by Y = 15 sin $(660\pi t - 0.02\pi x)$ cm. The frequency of the wave is

A. 330 Hz

B. 342 Hz

C. 365 Hz

D. 660 Hz

Answer: A

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The Speed Of A Travelling Wave

1. The speed of transverse wave on a stretched string is

A. directly proportional to the tension in the string

B. directly proportional to the square root of the tension

C. inversely proportional to live

D. inversely proportional to sqyare of tension

Answer: B

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2. A sound is produced by plucking a string in a musical instrument, then

A. the velocity of the wave in the string is equal to the velocity of sound in the string

B. the frequency of wave in the string is equal to the frequency of the sound produced

C. the wave in the string is progrressive

D. the tension in the string varies from point to point

Answer: B

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3. Of the following properties of a wave, the one that is independent of the others is its :

A. Velocity

B. Frequency

C. Amplitude

D. Wavelength

Answer: C

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4. A transverse wave is represented by $y = A\sin(\omega t - kx)$. For what value of the wavelength is the wave velocity equal to the maximum particle velocity?

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

B. πA

C. $2\pi A$

D. A

Answer: C

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5. A 10 m long steel wire has mass 5 g. If the wire is under a tension of 80 N, the speed of transverse waves on the wire is

A. $100ms^{-1}$

B. $200ms^{-1}$

C. $400ms^{-1}$

D. $500ms^{-1}$

Answer: C

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6. The transverse displacement of a string clamped at its both ends is given by $y(x, t) = 0.06 \sin\left(\frac{2\pi}{3}x\right) \cos(l20\pi t)$ where x and y are in m and t in s. The length of the string is 1.5

m and its mass is 3×10^{-2} kg. The tension in the string is

A. 324 N

B. 648 N

C. 832 N

D. 972 N

Answer: B

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7. A transverse harmonic wave on a string is described by y(x, t) = 3sin (36t + 0.018x + π/4) where x and Y are in cm and t is in s. Which of the following statements is incorrect?

A. The waves is travelling in negative x-direction

B. The amplitude of the wave is 3 cm

C. The speed of the wave is $20ms^{-1}$

D. The frequency of the wave is $\frac{9}{\pi}$ Hz.

Answer: D

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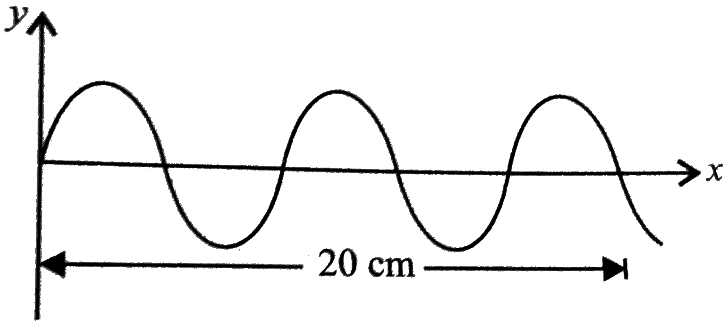
8. Figure given shows a sinusoidal wave on a string. If the frequency of the wave is 150 Hz, what is the velocity and wavelength of the given wave?



A. $0.04m,\ 10ms^{-1}$

B. $0.06m,\ 12ms^{-1}$

C. $0.08m,\ 10ms^{-1}$

D. $0.08m,\ 12ms^{-1}$

Answer: D

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9. Newton assumed that sound propagation in a gas takes under

A. isothemal condition

B. adiabatic condition

C. isobaric condition

D. isentropic condition

Answer: A

Watch Video Solution

10. According to Newton's formula, the speed of sound in air at STP is

(Take the mass of 1 mole of air is 29×10^{-3} kg)

A. $250 ms^{-1}$

B. $260 ms^{-1}$

C. $270 ms^{-1}$

D. $280 ms^{-1}$

Answer: D

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11. Out of the following gases under similar condition of temperature and pressure, the velocity of sound will be maximum in a) hydrogen b) nitrogen c) oxygen d) chlorine

A. hydrogen

B. nitrogen

C. oxygen

D. chlorine

Answer: A

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12. Speed of sound waves in a fluid depends

A. directly proportional to the square root of bulk modulus of the medium.

B. inversely proportional to the bulk modulus of the medium.

C. directly proportional to the density of the medium

D. inversely proportional to the density of the medium

Answer: A

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13. If v_{rms} is the rms speed of molecules in a gas and v is the speed of sound waves in the gas, then the ratio $\frac{v_{rms}}{v}$ is

A. $\sqrt{\frac{3}{\gamma}}$

B. $\sqrt{\frac{\gamma}{3}}$

C. $\sqrt{3\gamma}$

D. $\frac{\sqrt{3}}{\gamma}$

Answer: A

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14. At what temperature will the speed of sound in air be 3 times its value at 0° C?

A. $1184^{\circ} C$

B. $1148^{\circ} C$

C. $2184^{\circ} C$

D. $2148^{\circ} C$

Answer: C

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15. If the bulk modulus of water is 2100 M Pa, what is the speed of sound in water ?

A. $1450ms^{-1}$

B. $2100ms^{-1}$

C. $1400ms^{-1}$

D. $1200ms^{-1}$

Answer: A

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16. The ratio of the velocity of sound in Hydrogen gas $\left(\gamma = \frac{7}{5}\right)$ to that in Helium gas $\left(\gamma = \frac{5}{3}\right)$ at the same temperature is $\sqrt{\frac{21}{3}}$.

A. $\sqrt{\frac{5}{42}}$

B. $\sqrt{\frac{5}{21}}$

C. $\frac{\sqrt{42}}{5}$

D. $\frac{\sqrt{21}}{5}$

Answer: C

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17. Velocity of sound in vacuum is

A. zero

B. $330ms^{-1}$

C. $360ms^{-1}$

D. $660ms^{-1}$

Answer: A

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18. The relation between frequency 'n' wavelength $'\lambda'$ and velocity of propagation 'v' of wave is

A. $v = \frac{\lambda}{v}$

B. $v = \lambda v$

C. $v = \frac{v}{\lambda}$

D. None of these

Answer: C

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19. A hospital uses an ultrasonic scanner to locate tumours in a tissue. The operating freqency of the scanner is 3.2 MHz. The speed of sound in a tissue is 1.6 km s^{-1}. The wavelength of sound in the tissue is a) 0.25 mm b) 0.5 mm c) 0.75 mm d) 1 mm

A. 0.25 mm

B. 0.5 mm

C. 0.75 mm

D. 1 mm

Answer: B

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20. A body sends waves 100mm long through medium A and 0.25m long in medium B. If the velocity of waves in medium A is $80 cm s^{-1}$, calculate the velocity of waves in medium B. a) 1 m/s b) 2 m/s c) 3 m/s d) 4 m/s

A. $1 m s^{-1}$

B. $2 m s^{-1}$

C. $3 m s^{-1}$

D. $4 m s^{-1}$

Answer: B

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21. Sounds waves travel at $350m/s$ through a warm air and at $3500m/s$ through brass. The wavelength of a $700Hz$. Acoustic wave as it enters brass from warm air

A. decreases by a factor 10

B. increases by a factor 10

C. increases by a factor 10

D. decreases by a factor 20

Answer: C

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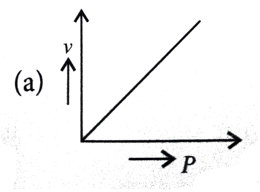
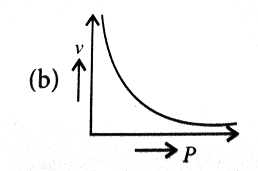
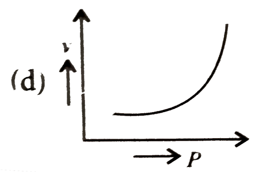
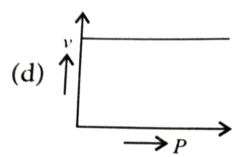
22. A student plotted the following four graphs representing the variation of velocity of sound in a gas with the pressure P. Whic one is correct?

A. 

B. 

C. 

D. 

Answer: D

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23. 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 km s^{-1}, and that of P wave is 8.0 kms^{-1}. A seismograph records P and S waved from an earthquake. The first P wave arrives 4 min before the first S wave. Assuming the waves travel in straight line, how far away does the earthquake occur?

A. 192 km

B. 384 km

C. 1920 km

D. 3840 km

Answer: C

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The Principle Of Superposition Of Waves

1. A travelling wave represented by

$y = A\sin(\omega t - kx)$

is superimposed on another wave represented by

$y = A\sin(\omega t + kx)$. The resultant is

A. standing wave having nodes at x= $\left(n + \frac{1}{2}\right)\frac{\lambda}{2}$, n=0,1,2,â€¦.

B. satnding wave having nodes at $x = \frac{n\lambda}{2}$,n=0,1,2..

C. wave travelling along +x direction

D. wave travelling along-x direction

Answer: B

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2. The stationary wave y = 2a sinkx cosωt in a stretched string is the result of superposition of $y_1 = a\sin(kx - \omega t)$ and

A. $y_2 = a\cos(kx + \omega t)$

B. $y_2 = a\sin(kx + \omega t)$

C. $y_2 = a\cos(kx - \omega t)$

D. $y_2 = a\sin(kx - \omega t)$

Answer: B

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Reflection Of Waves

1. When sound wave is refracted from air to water, which of the following will remain unchanged?

A. Wavelength

B. Wave number

C. wave velocity

D. Frequency

Answer: D

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2. The phenomenon of echo is an example of

A. reflection

B. refraction

C. beat

D. resonance

Answer: A

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3. A pulse of a wavetrain travels along a stretched string and reaches the fixed end of the string. It will be reflected back with

A. a phase change of 180° with velocity reversed.

B. the same phase as the incident pulse with no reversal of velocity

C. a phase change of 180° with no reversal of velocity.

D. the same phase as the incident pulse but with velocity reversed.

Answer: A

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4. In case of a travelling wave, the reflection at a rigid boundary will take place with a phase change of

A. $\frac{\pi}{2}$ radian

B. $\frac{\pi}{4}$ radian

C. $\frac{\pi}{6}$ radian

D. π radian

Answer: D

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5. A man standing between two parallel hills, claps his hand and hears successive echoes at regular intervals of 1s. If velocity of sound is 340 m s^{-1}, then the distance between the hills is

A. 100 m

B. 170 m

C. 510 m

D. 340 m

Answer: C

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6. A stone is dropped into a pond from the top of the tower of height h. If v is the speed of sound in air, then the sound of splash will be heard at the top of the tower after a time

A. $\sqrt{\frac{2h}{g}} + \frac{h}{v}$

B. $\sqrt{\frac{2h}{g}} - \frac{h}{v}$

C. $\sqrt{\frac{2h}{g}}$

D. $\sqrt{\frac{2h}{g}} + \frac{2h}{v}$

Answer: A

7. A bat emits ultrasonic sound of frequency 100 kHz in air. If this sound meets a water surface, the wavelengths of the reflected and transmitted sound are (Speed of sound in air = 340 m s^{-1} and in water = 1500 m s^{-1})

A. 3.4 mm, 30 mm

B. 6.8 mm, 15 mm

C. 3.4 mm, 15 mm

D. 6.8 mm, 30 mm

Answer: C

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8. In a stationary longitudinal wave, nodes are points of

A. minimum displacement and minimum pressure change.

B. minimum displacement and maximum pressure change

C. maximum displacement and maximum pressure change

D. maximum displacement and minimum pressure change.

Answer: B

Watch Video Solution

9. Which of the following statements is correct?

A. The distance between any two consecutive antinodes or nodes is $\frac{\lambda}{4}$

B. The distance between a node and adjoining antinode is $\frac{\lambda}{4}$

C. In the open end is an node.

D. In the closed end is an antinode.

Answer: B

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10. In an organ pipe of length L open at both ends, the fundamental mode has a frequency (where v is a speed of sound in air)

A. $\frac{v}{2L}$ and only odd harmonies are present.

B. $\frac{v}{2L}$ and only even harmonies are present.

C. $\frac{v}{2L}$ and all harmonies are present.

D. $\frac{v}{4L}$ and only odd harmonies are present.

Answer: C

Watch Video Solution

11. The transverse displacement of a string clamped at its both ends is given by

$$y(x,t) = 2\sin\left(\frac{2\pi}{3}x\right)\cos(100\pi t)$$

where x and y are in cm and t is in s.

Which of the following statements is correct?

A. All the points on the string between two consecutive nodes vibrate with same frequency, phase and amplitude.

B. All the points on the string between two consecutive nodes vibrate with same frequency and phase but different amplitude.

C. All the points on the string between two consecutive nodes vibrate with different frequency and phase but same amplitude.

D. All the points on the string between two consecutive nodes vibrate with different frequency, phase and amplitude

Answer: B

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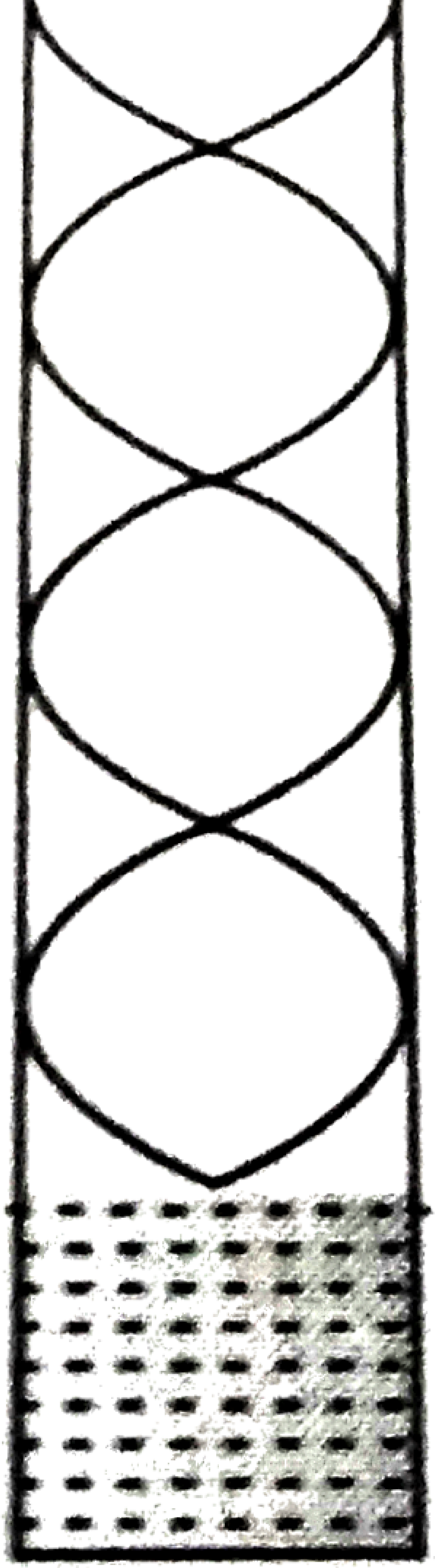
12. One of the modes of resonance in a tube containing water at one end has been shown. The tube in the present case is in



A. first harmonic

B. third harmonic

C. fifth harmonic

D. seventh harmonic

Answer: D

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13. Two open organs pipes of fundamental frequencies v_1 and v_2 are joined in series. The fundamental frequency of the new pipe so obtained will be

A. $v_1 + v_2$

B. $\dfrac{v_1 v_2}{(v_1 + v_2)}$

C. $\dfrac{v_1 v_2}{v_1 + v_2}$

D. $\sqrt{(v_1^2 + v_2^2)}$

Answer: B

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14. A second harmonic has to be generated in a string of length l stretched between two rigid supports. The point where the string has to be plucked and touched are

A. Plucked at $\frac{L}{4}$ and touch at $\frac{L}{2}$

B. Plucked at $\frac{L}{4}$ and touch at $\frac{3L}{2}$

C. Plucked at $\frac{L}{2}$ and touch at $\frac{L}{2}$

D. Plucked at $\frac{L}{2}$ and touch at $\frac{3L}{4}$

Answer: A

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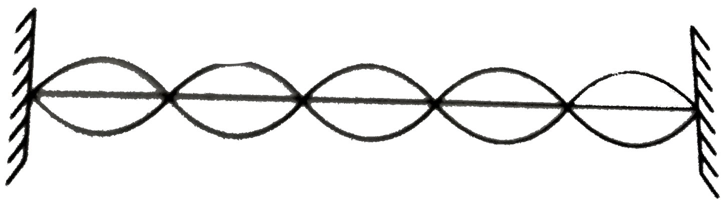
15. A string fixed at its both ends vibrates in 5 loops as shown in the figure. The total number of nodes and antinodes are respectively



A. 5,6

B. 6,5

C. 7,4

D. 4,7

Answer: B

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16. Which of the following statements is incorrect 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: C

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17. The fundamental note produced by a closed organ pipe is of frequency v. The fundamental note produced by an open organ pipe of same length will be of frequency

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

B. v

C. $2v$

D. $4v$

Answer: C

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18. A steel rod of length 100 cm is clamped at the middle. The frequency of the fundamental mode for the longitudinal vibrations of the rod is (Speed of sound in steel = 5 km s^{-1}) a) 1.5 KHz b) 2 KHz c) 2.5 KHz d) 3 KHz

A. 1.5 KHz

B. 2 KHz

C. 2.5 KHz

D. 3 KHz

Answer: C

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19. A pipe 30 cm long, is open at both ends. Which harmonic mode of the pipe resonates a 1.1 kHz source? (Speed of sound in air = 330 m s^{-1}) a) First b) Third c) Second d) Fourth

A. First

B. Third

C. Second

D. Fourth

Answer: B

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20. The frequency of tuning fork is 256 Hz. It will not resonate with a fork of frequency

A. 768 Hz

B. 738 Hz

C. 512 Hz

D. 256 Hz

Answer: B

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21. When a string fixed at its both ends vibrates in 1 loop, 2 loops, 3 loops and 4 loops, the frequencies are in the ratio

A. 1 : 1 : 1 : 1

B. 1 : 2 : 3 : 4

C. 4 : 3 : 2 : 1

D. 1 : 4 : 9 : 16

Answer: B

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22. A pipe 17 cm long is closed at one end. Which harmonic mode of the pipe resonates a 1.5 kHz source? (Speed of sound in air = 340 m s^{-1})

A. First

B. Third

C. Fifth

D. Seventh

Answer: B

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23. A resonance air column shows resonance with a tuning fork of frequency 256 Hz at column lengths 33.4 cmand 101.8 cm. find (i) end-correction and (ii) the speed of sound in air.

A. 1. $300ms^{-1}$

B. 2. $250ms^{-1}$

C. 3. $390ms^{-1}$

D. 4. $350ms^{-1}$

Answer: D

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24. A wire is stretched between two rigid supports vibrates in its fundamental mode with a frequency of 50 Hz. The mass of the wire is 30 g and its linear density is 4×10^{-2} kg m s^{-1}. The speed of the transverse wave at the string is

A. $25ms^{-1}$

B. $50ms^{-1}$

C. $75ms^{-1}$

D. $100ms^{-1}$

Answer: C

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25. A guitar string is 90 cm long and has a fundamental frequency of 124 Hz. Where should it be pressed to produce a fundamatal frequecy of 186 Hz?

A. 60 cm

B. 30 cm

C. 20 cm

D. 10 cm

Answer: A

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26. A stretched wire emits a fundamental note of2 56 Hz. Keeping the stretching force constant and reducing the length of wire by 10 cm, the frequency becomes 320 Hz, the original length of the wire is

A. 100 cm

B. 50 cm

C. 400 cm

D. 200 cm

Answer: B

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27. A tuning fork of frequency 440 Hz resonates with a tube closed at one end of length 18 cm and diameter 5 cm in fundamental mode. The velocity of sound in air is

A. 1. $336ms^{-1}$

B. 2. $343ms^{-1}$

C. 3. $300ms^{-1}$

D. 4. $350ms^{-1}$

Answer: B

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28. Two pipes are each 50 cm in length. One of them is closed at one end while the other is open at both ends. The speed of sound in air is 340 m s^{-1}. The frequency at which both the pipes can resonate is

A. 1. 680 Hz

B. 2. 510 Hz

C. 3. 85 Hz

D. 4. None of these

Answer: D

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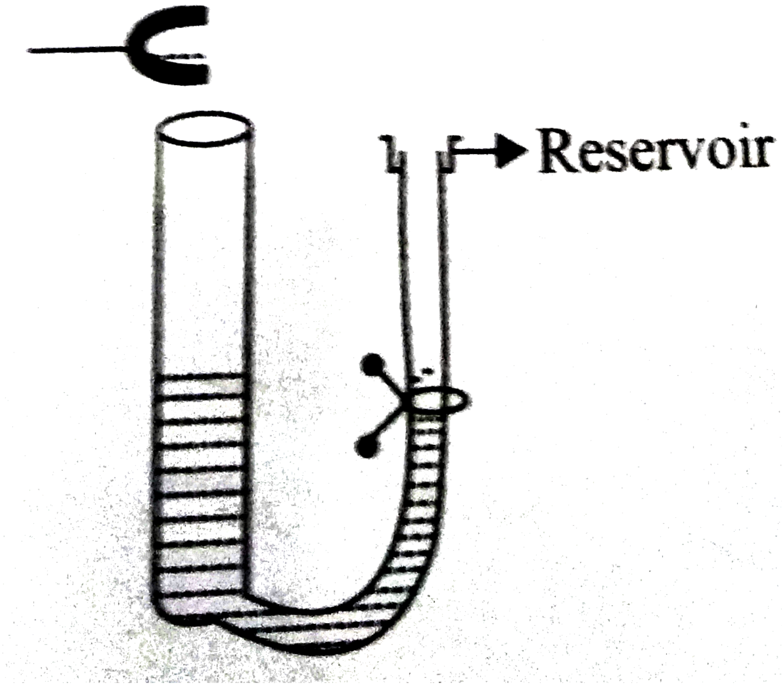
29. A tuning fork vibrating with a frequency of 500 Hz is kept close to the open end of a tube filled with water, as shown in figure. The water level in the tube is gradually lowered When the water level is 17 cm below the open to open end, maximum intensity of sound is heard. If the room temperature is 20° C, the speed of sound in air at the temperature is



A. 1. $330ms^{-1}$

B. 2. $340ms^{-1}$

C. 3. $350ms^{-1}$

D. 4. $360ms^{-1}$

Answer: B

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30. String A has a length L, radius of cross-section r, density of material p and is under tension T. String B has all these quantities double those of string A. If v_a and v_b are the corresponding fundamentals frequencies of the vibrating string,then

A. 1. $v_A = 2v_B$

B. 2. $v_A = 4v_B$

C. 3. $v_B = 4v_A$

D. 4. $v_A = v_B$

Answer: B

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31. A glass tube of $1.0m$ length is filled with water . The water can be drained out slowly at the bottom of the tube . If a vibrating tuning fork of frequency $500Hz$ is brought at the upper end of the tube and the velocity of sound is $300m/s$, then the total number of resonances obtained will be

A. A. 4

B. B. 3

C. C. 2

D. 4. 1

Answer: B

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Beats

1. Which of the following phenomenon is used by the musicians to tune their musical instruments?

A. Interferance

B. Diffraction

C. Beats

D. Polarisation

Answer: C

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2. The phenomenon of beats can take place

A. for longitudinal and transverse waves

B. for transverse wave only

C. for sound waves only

D. for both longitudinal and transverse waves

Answer: D

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3. When two waves of almost equal frequencies v_1 and v_2 reach at a point simultaneously, the time interval between successive maxima is

A. $v_1 + v_2$

B. $v_1 - v_2$

C. $\dfrac{1}{v_1 + v_2}$

D. $\dfrac{1}{v_1 - v_2}$

Answer: D

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4. When two sound sources of the same amplitude but of slightly different frequencies v_1 and v_2 are sounded simultaneously, the sound one hears has a frequency equal to

A. $|v_1 - v_2|$

B. $\left|\frac{v_1 - v_2}{2}\right|$

C. $\sqrt{v_1 v_2}$

D. $|v_1 + v_2|$

Answer: B

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5. A and B are two wires whose fundamental frequencies are 256 and 382 Hz respectively. How many beats in 2 seconds will be heard by the third harmonic of A and second harmonic of B?

A. 4

B. 8

C. 16

D. zero

Answer: B

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6. Two tuning forks, A and B, produce notes of frequencies 258 Hz and 262 Hz. An unknown note sounded with A produces certain beats. When the same note is sounded with B, the beat frequency gets doubled. The unknown frequency is

A. 250 Hz

B. 252 Hz

C. 254 Hz

D. 256 Hz

Answer: C

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7. 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 tuning fork B when not loaded? a) 502 Hz b) 507 Hz c) 517 Hz d) 522 Hz

A. 502 Hz

B. 507 Hz

C. 517 Hz

D. 522 Hz

Answer: C

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8. Two sitar strings A and B are slightly out of tune and produce beats of frequency 5 Hz. When the tension in the string B is slightly increased, the beat frequency is found to reduce to 3 Hz. If the frequency of string A is 427 Hz, the original frequency of string B is

A. 422 Hz

B. 424 Hz

C. 430 Hz

D. 432 Hz

Answer: A

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9. A sound wave travels with a velocity of 300 m s^{-1} through a gas. 9 beats are produced in 3 s when two waves pass through it simultaneously. If one of the waves has 2 m wavelength, the wavelength of the other wave is a) 1.98 m b) 2.04 m c) 2.06 m d) 1.99 m

A. 1.98 m

B. 2.04 m

C. 2.06 m

D. 1.99 m

Answer: B

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10. A closed organ pipe and an open organ pipe of same length produce 2 beats/second while vibrating in their fundamental modes. The length of the open organ pipe is halved and that of closed pipe is doubled. Then, the number of beats produced per second while vibrating in the fundamental mode is

A. 2

B. 6

C. 8

D. 7

Answer: D

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11. There are 26 tuning forks arranged in the decreasing order of their frequencies. Each tuning fork gives 3 beats with the next. The first one is octave of the last. What is the frequency of 18th tuning fork ?

A. 100 Hz

B. 99 Hz

C. 96 Hz

D. 103 Hz

Answer: B

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12. Two turning forks of frequencies n_1 and n_2 produces n beats per second. If n_2 and n are known, n_1 may be given by

A. $\frac{n_2}{n} + n_2$

B. $n_2 n$

C. $n_2 \pm n$

D. $\frac{n_2}{n} - n_2$

Answer: C

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1. Doppler effect is applicable for a) sound waves only b) light waves only c) both sound and light waves d) None of these

A. sound waves only

B. light waves only

C. both sound and light waves

D. None of these

Answer: C

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2. Match the Column I with Column II

	Column I		Column II
(A)	Change in apparent frequency due to the relative motion between source and listener is	(p)	Beats
(B)	Intensity of sound varies with time in	(q)	Transverse wave
(C)	Sound waves in air are	(r)	Doppler's effect
(D)	Light waves are	(s)	Longitudinal wave

A. A-p, B - q, C- r, D - s

B. A q, B - r, C - s, D - p

C. A - r, B - p, C-s, D - q

D. A - r, B s, C - p, D - q

Answer: C

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3. 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 30 ms^{-1} towards the platform. The frequency of the sound heard by an observer standing on the platform is

(Speed of sound in air = 330 m s^{-1})

A. 420 Hz

B. 430 Hz

C. 440 Hz

D. 450 Hz

Answer: C

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4. A train, standing in a station yard, blows a whistle of frequency 400Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of 10m//s. Given that the speed sound in still air is $340m / s$,

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 330 ms^{-1}

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

Answer: A

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5. A train moving at a speed of $220ms^{-1}$ towards a stationary object emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is (speed of sound in air is $330ms^{-1}$)

A. 3500 Hz

B. 4000 Hz

C. 5000 Hz

D. 3000 Hz

Answer: C

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6. A train approaching a railway platform with a speed of 20 m s^{-1} starts blowing the whistle. Speed of sound in air is 340 ms^{-1}. If the frequency of the emitted sound from the whistle is 640 Hz, the frequency of sound as heard by person standing on the platform

A. 600 Hz

B. 640 Hz

C. 680 Hz

D. 720 Hz

Answer: C

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7. An observer moves towards a stationary source of sound. The percentage change in the apparent frequency is

A. zero

B. 0.05

C. 0.1

D. 0.2

Answer: D

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8. A source of sound producing wavelength 50 cm is moving away from a stationary observer with

$\left(\frac{1}{5}\right)^{th}$ speed of sound. Then what is the wavelength of sound received by the observer?

A. 55 cm

B. 40 cm

C. 60 cm

D. 70 cm

Answer: C

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9. A policeman blows a whistle with a frequency of 500 Hz.A car approaches him with a velocity of $15ms^{-1}$.Calculate the change in frequency as heard by the driver of the car as he passes the policeman. Speed of sound in air is $300ms^{-1}$. a) 25 Hz b) 50 Hz c) 100 Hz d) 150 Hz

A. 25 Hz

B. 50 Hz

C. 100 Hz

D. 150 Hz

Answer: B

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10. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an expression for the beat frequency heard by the motorist.

A. $\left(\frac{v+v_m}{v+v_b}v\right.$

B. $\frac{v+v_m}{v-v_b}v$

C. $\left(2v_b\frac{v+v_m}{v^2-v_b^2}v\right.$

D. $\left(2v_m\frac{v+v_b}{v^2-v_m^2}v\right.$

Answer: C

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Higher Order Thinking Skills

1. One end of a taut string of length $3m$ along the x-axis is fixed at $x = 0$. The speed of the waves in the string is $100ms^{-1}$. The other end of the string is vibrating in the y-direction so that stationary waves are set up in the string. The possible wavelength(s) of these sationary waves is (are)

A. $y(t) = A\frac{\sin(2\pi x)}{6}\frac{\cos(50\pi t)}{3}$

B. $y(t) = A\frac{\sin(\pi x)}{3}\frac{\cos(100\pi t)}{3}$

C. $y(t) = A\frac{\sin(5\pi x)}{6}\frac{\cos(255\pi t)}{3}$

D. $y(t) = A\frac{\sin(5\pi x)}{2}\cos 250\pi t$

Answer: D

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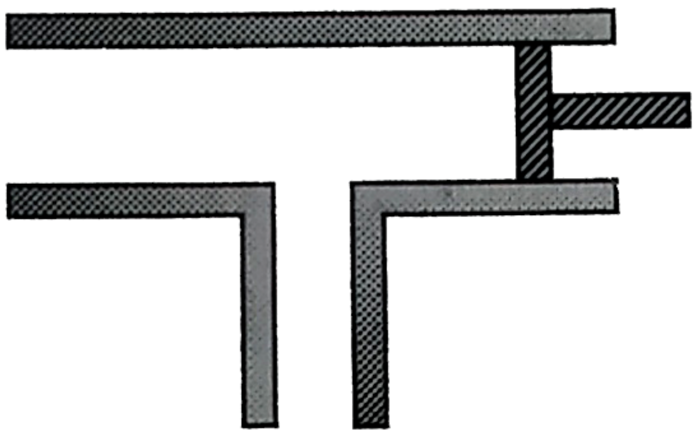
2. Vibrating tuning fork of frequency n is placed near the open end of a long cylindrical tube. The tube has a side opening and is fitted with a movable reflecting piston. As the piston is moved through $8.75 cm$, the intensity of sound changes from a maximum to minimum. If the speed of sound is $350 m / s$. Then n is



A. 500 Hz

B. 1000 Hz

C. 2000 Hz

D. 4000 Hz

Answer: B

Watch Video Solution

3. Three travelling waves are superimposed. The equations of the wave are

$y_! = A_0 \sin(kx - \omega t)$, $y_2 = 3\sqrt{2}A_0 \sin(kx - \omega t + \phi)$

and $y_3 = 4A_0 \cos(kx - \omega t)$

find the value of $\phi(\text{given } 0 \leq \phi \leq \pi/2)$ if the phase difference between the resultant wave and first wave is $\pi/4$

A. $\frac{\pi}{6}$

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

C. $\frac{\pi}{12}$

D. None of these

Answer: C

Watch Video Solution

4. Find the temperature at which the fundamental frequency of an organ pipe is independent of small variation in temperature in terms of the coefficient of linear expansion (α) of the material of the tube.

A. $1/3\alpha$

B. $1/2\alpha$

C. $1/4\alpha$

D. $1/5\alpha$

Answer: B

Watch Video Solution

5. An organ pipe of cross-sectional area 100 cm^2 resonates with a tuning fork of frequency 1000 Hz in fundamental tone. The minimum volume of water to be drained so the pipe again resonates with the same tuning fork is

(Take velocity of wave = 320 m s^{-1})

A. $800 cm^3$

B. $1200 cm^3$

C. $1600 cm^3$

D. $2000 cm^3$

Answer: C

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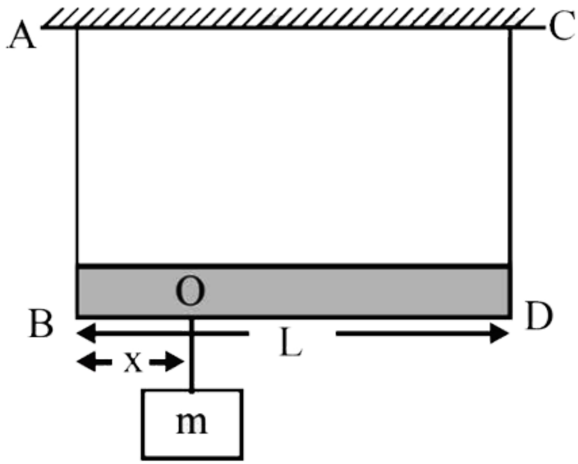
6. A massless rod of length L is suspened by two identical string AB and CD of equal length. A block of mass m is suspended from point O such that BO is equal to 'x'. Further it is observed that the frequency of $1st$ harmonic in AB is equal to $2nd$ harmonic frequency in CD. 'x' is



A. $\frac{L}{5}$

B. $\frac{4L}{5}$

C. $\frac{3L}{4}$

D. $\frac{L}{4}$

Answer: A

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7. A stationary source is emitting sound at a fixed frequency f_0, which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected from the cars is 1.2% of f_0. What is the difference in the speeds of the cars (in km per hour) to the nearest integer ?

The cars are moving at constant speeds much smaller than the speed of sound which is $330ms^{-1}$

.

A. 2

B. 3

C. 5

D. 7

Answer: D

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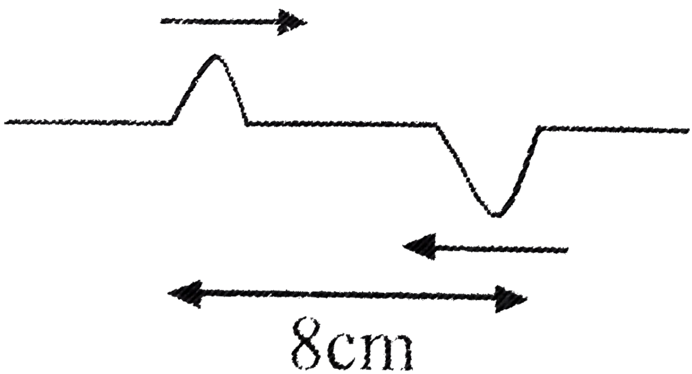
8. Two pulses in a stretched string whose centres are initially 8 cm apart are moving towards each other as shown in the figure. The speed of each pulse is 2 cm/s. After 2 second, the total energy of the pulses will be



A. zero

B. purely kinetic

C. purely potential

D. partly kinetic and partly potential

Answer: B

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Ncert Exemplar

1. The 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

A. neither longitudinal nor transverse

B. both longitudinal and transverse

C. only longitudinal

D. only transverse.

Answer: B

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2. Sound waves of wavelength α travelling in a medium with a speed of v m s^{-1} enter into another medium where its speed is 2v m s^{-1}. Wavelength of sound waves in the second medium is

A. λ

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

C. 2λ

D. 4λ

Answer: C

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3. Speed of sound waves in air a) is independent of temperature b) increases with pressure c) increases with increase in humidity d) decreases with increase in humidity.

A. is independent of temperature

B. increases with pressure

C. increases with increase in humidity

D. decreases with increase in humidity.

Answer: C

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4. 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

A. frequency of sound waves

B. amplitude of sound waves

C. wavelength of sound waves.

D. loudness of sound waves

Answer: C

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5. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are a) matter b) energy c) energy and matter d) energy, matter and momentum

A. matter

B. energy

C. energy and matter

D. energy, matter and momentum

Answer: B

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6. Which of the following statements are true wave motion? a) Mechanical transverse waves can propagate through all mediums. b) Longitudinal waves can propagate through solids only c) Mechanical transverse waves can propagate through only d) Longitudinal waves can propagate through vacuum.

A. Mechanical transverse waves can propagate through all mediums.

B. Longitudinal waves can propagate through solids only

C. Mechanical transverse waves can propagate through only

D. Longitudinal waves can propagate through vacuum.

Answer: C

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7. A sound wave is passing through air column in the form of compression and rerefactions. In consecutive compressions and rerefactions.

A. density remains constant

B. Boyles law is obeyed

C. bulk modulus of air oscillates

D. there is no transfer of heat.

Answer: D

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8. 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 amplitude 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: B

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9. A string of mass 2.50kg is under a tension os 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?

A. one second

B. 0.5 second

C. 2 second

D. data given is insuffcent

Answer: B

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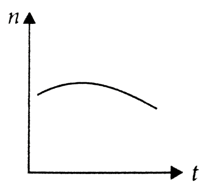
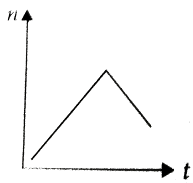
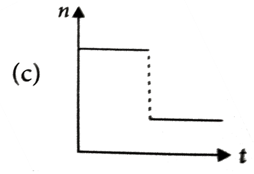
10. A train whistling at constant frequency is moving towards a station at a constant speed V. The train goes past a stationary observer on the station. The frequency n' of the sound as heard by the observer is plotted as a function of time t, figure. Identify the expected curve.

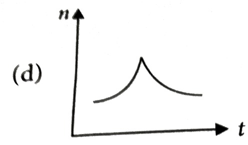
A. (a)



B. (b)



C. 

D. 

Answer: C

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Assertion And Reason

1. Assertion : A wave is motion of matter as a whole in a medium.

Reason : Wind is same as sound wave in air.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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2. With the propagation of a longitudinal wave through a material medium, the quantities transmitted in the propagation direction are

A. Energy, momentum and mass

B. Energy

C. Energy and mass

D. Energy and linear momentum

Answer: C

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3. S_1: Source and observer both are stationary and wind is blowing in a direction from source to observer then observer detects an apparent increase in frequency.

S_2: Beat frequency is defined as the difference of frequency of two sources.

S_3: Pressure node is always a displacement node and pressure antinode is always a displacement antinode.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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4. Assertion: The change in air pressure effects the speed of sound.

Reason: The speed of sound in gases is proportional to the square of pressure.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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5. Assertion : The speed of soun in solids is maximum though density is large.

Reason : The coefficient of elasticity of solid is large.

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

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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6. Assertion : Speed of mechanical wave in the medium depends on the velocity of source, relative to an observer at rest.

Reason : Speed of mechanical wave is independent of the elastic and other properties such as mass density of the medium.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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7. Assertion : The basic of Laplace correction was that, exchange of heat between the region of compression and rarefaction in air is not possible.

Reason : Air is a bad conductor of heat and velocity of soundin air is large.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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8. 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. 1. increase

B. 2. decrease

C. 3. remains constant

D. 4. becomes zero

Answer: A

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9. Statement-1: On reflection from a rigid boudnary (denser medium), there is a complete reversal of phase

Statement-2: This is because on reflection is a denser medium, both the particle velocity and wave velocity are reversed in sign.

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

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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10. In standing waves, select incorrect

A. All particle between two consecutive nodes vibrate in same phase

B. Particles on opposite side of a node vibrate in same phase

C. Frequency of oscillation of all particles (except nodes) is same

D. Formation of standing waves is a special type of interference phenomana.

Answer: D

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11. Assertion : The interference of two identical waves moving in same direction produces standing waves.

Reason : Various elements of standing waves do not remain in constant phase.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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12. Assertion: The fundamental frequency of an open organ pipe increases as the temperature is increased.

Reason: As the temperature increases, the velocity of sound increases more rapidly than length of the pipe.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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13. Assertion : The sound emitted by the source travels in all directions.

Reason : The relative velocity of sound with respect to the observer is the sum of velocity of sound and velocity of observer.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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14. When a source of sound passes us, whether it be a car horn or a train whistle, the pitch we hear goes from high to low. Explain why. Use any relation to support your explanation.

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15. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

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

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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