PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

WAVES

Physics

1. Where should the two bridges be set in a 110cm long wire so that it is divided into three

parts and the ratio of the frequencies are $3:2:1$?

A. 20 cm from one end and 60 cm from other end

B. 30cm from one end and 70cm from other end

C. 10cm from one end and 50cm from other end

D. 50cm from one end and 40cm from other end

Answer:

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2. When a wave travels in a medium, the particle displacement is given by the equation $y = a\sin 2\pi(bt - cx)$, where a, b and c are constants. The maximum particle velocity will be twice the wave velocity. If

A. $c = \frac{1}{\pi a}$

B. $c = \pi a$

C. b =ac

D. $b = \frac{1}{ac}$

Answer:

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3. The wave described by $y = 0.25\sin(10\pi x - 2\pi t)$, where x and y are in metres and t in seconds , is a wave travelling along the:

A. $-ve$ x direction with frequency 1 Hz.

B. $+ve$ x direction with frequency π Hz and wavelength $\lambda = 0.2m$

C. $+ve$ x direction with frequency 1 Hz and wavelength $\lambda = 0.2m$

D. $-ve$ x direction with amplitude 0.25 m and wavelength $\lambda = 0.2m$

Answer: C

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4. The equation of a plane progressive wave is $y = 0.9\sin 4\pi\left[t - \frac{\mathrm{x}}{2}\right]$. When it is reflected at a rigid support , its amplitude becomes $\frac{2}{3}$ of its previous value. The equation of the reflected wave is

A. $y = 0.6\sin 4\pi\left[t + \frac{x}{2}\right]$

B. $y = -0.6\sin 4\pi\left[t + \frac{x}{2}\right]$

C. $y = 0.9\sin 8\pi\left[t - \frac{x}{2}\right]$

D. $y = -0.6\sin 4\pi\left[t + \frac{x}{2}\right]$

Answer:

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5. A person carrying a whistle emitting continuously a note of $272Hz$ is runnig towards a reflecting surface with a speed of $18km/h$. The speed of sound in air is $345ms^{-1}$ The number of beats heard by him is

A. 4

B. 6

C. 8

D. zero

Answer:

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6. A closed organ pipe (closed at one end) is excited to support the third overtone. It is found that air in the pipe has

A. three nodes and three antinodes

B. three nodes and four antinodes

C. four nodes and three antinodes

D. four nodes and four antinodes

Answer:

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7. A wave disturbance in a medium is described by $y(x, t) = 0.02\cos\left(50\pi t + \frac{\pi}{2}\right)\cos(10\pi x)$ where x and y are in metre and t is in second .

Which of the following is correct ?

A. A node occurs at x = 0.15 m

B. An antinode occurs x = 0.3 m

C. The speed wave is $5ms^1$

D. The wavelength is 0.3 m

Answer:

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8. In a resonance column, first and second resonance are obtained at depths 22.7 cm and

70.2 cm. The third resonance will be obtained at a depth

A. 117.7 cm

B. 92 .9 cm

C. 115.5 cm

D. 113.5 cm

Answer:

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9. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km, it blows a whistle whose echo is heard by the driver after 5 seconds. If the speed of sound in air is 330 m/s, then the speed of the engine is :

A. 32 m/s

B. 27.5 m/s

C. 60 m/s

D. 30 m/s

Answer:

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10. The identical piano wires kept under the same tension T have a fundamental frequency of 600 Hz. The fractional increase in the tension of one of the wires which will lead to occurrence of 6 beats//s when both the wires oscillate together would be

A. 0.02

B. 0.03

C. 0.04

D. 0.01

Answer:

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11. Two sound sources emitting sound each of wavelength λ are fixed at a given distance apart. A listener moves with a velocity u along the line joining the two suorces. The number of beats heard by him per second is

A. $\frac{u}{2\lambda}$

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

C. $\frac{u}{\lambda}$

D. $\frac{u}{3\lambda}$

Answer:

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12. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

A. $0.5\ \%$

B. zero

C. $20\ \%$

D. $5\ \%$

Answer:

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13. Velocity of sound in air is $320 ms^{-1}$. A pipe closed at one end has a length of 1 m. Neglecting end correction, the air column in

the pipe cannot resonate with sound of frequency

A. 80Hz

B. 240 Hz

C. 320Hz

D. 400 Hz

Answer:

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14. The driver of a car travelling with speed $30ms^{-1}$ towards a hill sounds a horn of frequency 600 Hz. If the velocity of sound in air is $330ms^{-1}$, the frequency of reflected sound as heard by driver is

A. 555.5 Hz

B. 720 Hz

C. 500 Hz

D. 550 Hz

Answer:

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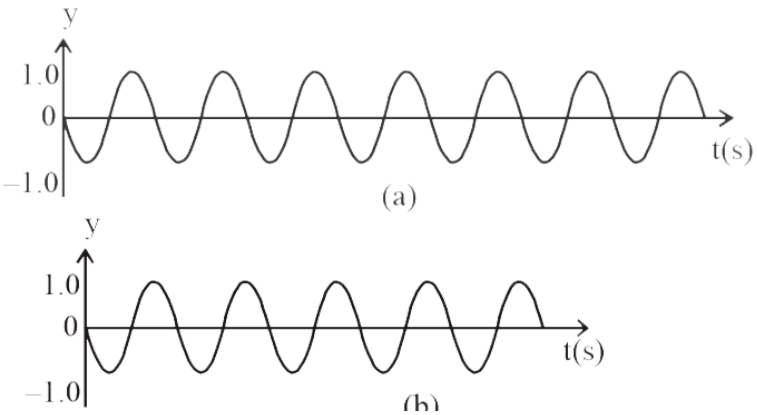
15. What will be the frequency of beats formed from the superposition of two harmonic waves shown below ?



A. 20 Hz

B. 11 Hz

C. 9 Hz

D. 2 Hz

Answer:

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16. What is the effect of increase in temperature on the frequency of sound produced by an organ pipe?

A. increase

B. decreases

C. no effect

D. erratic change

Answer:

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17. A cylinderical tube open at both ends, has a fundamental frequency f in air. The tube is dipped vertically in water so that half of it is in

water. The fundamental frequency of air column is now

A. f/2

B. f

C. 3f/4

D. 2f

Answer:

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18. The transverse displacement $y(x, t)$ of a wave on a string is given by $y(x, t) = e^{-\left(ax^2 + bt^2 + 2\sqrt{(ab)}xt\right)}$. This represents a :

A. wave moving in $-x$ direction with speed $\sqrt{\frac{b}{a}}$

B. standing wave of frequency $\sqrt{b}$

C. standing wave of frequency $\frac{1}{\sqrt{b}}$

D. wave moving in $+x$ direction with speed $\sqrt{\frac{a}{b}}$

Answer:

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19. A longitudinal wave is represented by

$$x = x_0 \sin 2\pi \left(\mathrm{nt} - \frac{\mathrm{x}}{\lambda} \right)$$

The maximum particle velocity will be four times the wave velocity if

A. $\lambda = \frac{\pi x_0}{4}$

B. $\lambda = 2\pi x_0$

C. $\lambda = \frac{\pi x_0}{2}$

D. $\lambda = 4\pi x_0$

Answer:

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20. Two tones of frequencies $n_1 \text{and} n_2$ are sounded together. The beats can be heard distinctly when

A. $10 < (n_1 - n_2) < 20$

B. $5 < (n_1 - n_2) > 20$

C. $5 < (n_1 - n_2) < 20$

D. $0 < (n_1 - n_2) < 10$

Answer:

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21. A pipe of length $85cm$ is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below $1250Hz$. The velocity of sound in air is $34m/s$.

A. 12

B. 8

C. 6

D. 4

Answer:

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22. A vehicle, with a horn of frequency n is moving with a velocity of 30 m/s in a direction perpendicular to the straight line joining the

observer and the vehicle. The observer perceives the sound to have a frequency $n + n_1$. Then (if the sound velocity in air is 300 m/s)

A. $n_1 = 10n$

B. $n_1 = 0$

C. $n_1 = 0.1n$

D. $n_1 = -0.1n$

Answer:

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23. A source of sound gives five beats per second when sounded with another source of frequency $100s^{-1}$. The second harmonic of the source together with a source of frequency $205s^{-1}$ gives five beats per second. What is the ferquency of the source?

A. $95\,\mathrm{sec}^{-1}$

B. $100\,\mathrm{sec}^{-1}$

C. $105\,\mathrm{sec}^{-1}$

D. $205\,\mathrm{sec}^{-1}$

Answer:

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24. If we study the vibration of a pipe open at both ends, then the following statements is not true

A. Odd harmonics of the fundamental frequency will be generated

B. All harmonics of the fundamental frequency will be generated

C. Pressure change will be maximum at both ends

D. Antinode will be at open end

Answer:

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25. Forty - one forks are so arranged that each products $5beat/s$ when sounded with its near fork . If the frequency of last fork is double the

frequency of first and last fork , respectively are

A. 200 , 400

B. 205 , 410

C. 195 , 390

D. 100 , 200

Answer:

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26. Two points are located at a distance of $10m$ and $15m$ from the source of oscillation. The period of oscillation is 0.05s and the velocity of the wave is $300m/s$. What is the phase difference between the oscillation of two points?

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

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

C. π

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

Answer:

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27. A sound absorber attenuates the sound level by $20dB$. The intensity decreases by a factor of

A. 100

B. 1000

C. 10000

D. 10

Answer:

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28. A wave travelling along the x-axis is described by the equation $v(x, t) = 0.005 \cos(\alpha x - \beta t)$. If the wavelength and the time period of the wave are $0.08m$ and $2.0s$, respectively, then α and β in appropriate units are

A. $\alpha = 25.00\pi, \beta = \pi$

B. $\alpha = \frac{0.08}{\pi}, \beta = \frac{2.0}{\pi}$

C. $\alpha = \frac{0.04}{\pi}, \beta = \frac{1.0}{\pi}$

D. $\alpha = 12.50\pi, \beta = \frac{\pi}{2.0}$

Answer:

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29. Which of the following statements is/are incorrect about waves ?

A. Waves are patterns of disturbance which move without the actual physical transfer of flow of matter as a whole.

B. Waves cannot transport energy.

C. The pattern of disturbance in the form of waves carry information that propagate from one point to another.

D. All our communications essentially depend on transmission of signals through waves.

Answer:

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30. An organ pipe P_1 open at one end vibrating in its first harmonic and another pipe P_2 open at ends vibrating in its third harmonic are in resonance with a given tuning fork. The ratio of the length of P_1 to that P_2 is

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

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

C. $\frac{1}{2}$

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

Answer:

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31. Two vibrating tuning forks producing waves given by $y_1 = 27\sin 600\pi t \text{ and } y_2 = 27\sin 604\pi t$ are held near the ear of a person, how many beats will be heard in three seconds by him ?

A. 4

B. 2

C. 6

D. 12

Answer:

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32. Consider the three waves z_1, $z_2 \text{and} z_3$ as

$z_1 = A\sin(kx - \omega t)$

$z_2 = A\sin(kx + \omega t)$

$z_3 = A\sin(ky - \omega t)$

Which of the following represents a standing wave?

A. $z_1 + z_2$

B. $z_2 + z_3$

C. $z_3 + z_1$

D. $z_1 + z_2 + z_3$

Answer:

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33. A sonometer wire supports a 4 kg load and vibrates in fundamental mode with a tunig fork of frequency 416 Hz. The length of the wire between the bridges is now doubled. In order to maintain fundamental mode, the load should be changed to

A. 1 kg

B. 2 kg

C. 4 kg

D. 16 kg

Answer:

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34. The vibrations of a string of length 60 cm fixed at both the ends are represented by the equation $y = 2\sin\left(\frac{4\pi x}{15}\right)\cos(96\pi t)$ where x and y are in cm. The maximum number of loops that can be formed in it is

A. 4

B. 16

C. 5

D. 15

Answer:

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35. If $n_1, n_2 \text{and} n_3$ are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by

A. $n = n_1 + n_2 + n_3$

B. $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

C. $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$

D. $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

Answer:

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36. If the ratio of maximum to minimum intensity in beats is 49, then the ratio of amplitudes of two progressive wave trains is

A. $7:1$

B. $4:3$

C. $49:1$

D. $16:9$

Answer:

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37. The transverse wave represented by the equation $y = 4\sin\left(\frac{\pi}{6}\right)\sin(3x - 15t)$ has

A. amplitude = 4

B. wavelength = $4\frac{\pi}{3}$

C. speed of propagation = 5

D. period = $\frac{\pi}{15}$

Answer:

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38. The fundamental frequency of a closed organ pipe of length $20cm$ is equal to the second overtone of an organ pipe open at

both the ends. The length of organ pipe open at both the ends is

A. 100 cm

B. 120 cm

C. 140 cm

D. 80 cm

Answer:

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39. The equation of a travelling wave is

$y = 60\cos(1800t - 6x)$

where y is in microns, t in seconds and x in metres. The ratio of maximum particle velocity to velocity of wave propagation is

A. 3.6×10^{-2}

B. 3.6×10^{-4}

C. 3.6×10^{-6}

D. 3.6×10^{-11}

Answer: B

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