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PHYSICS · JEE MAIN

Waves

Previous Year Questions with answers

180 questions · **142** papers · **2002–2026** · newest paper first

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What is in this PDF: every Waves question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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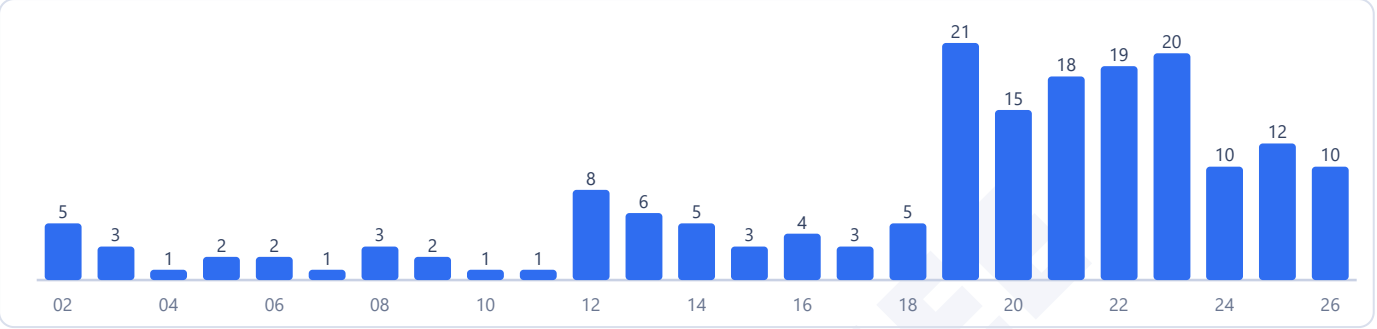
Chapter at a glance

2.7%	180	104 of 162	130 / 50
of Physics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Falling: 0.6 questions per paper in 2024–2026 against 0.9 in 2019–2023.

Questions per year



Counts are the questions we hold: 180 in 142 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Waves concludes the Class 11 Physics syllabus by analyzing mechanical energy transport through elastic strings and acoustic air columns. Across the papers we hold from 2019 to 2026, the chapter delivered **125 questions in 162 papers**, which translates to **0.8 questions per paper**, and was present in 104 of those 162 papers. Over this eight-year period, it holds the **22nd spot among 29 Physics chapters** by question count, representing 2.7% of all Physics questions.

Relative to the earlier AIEEE period, questions on waves have become less frequent. From 2002 to 2018, waves accounted for 4.1% of the Physics section; in the recent 2024 to 2026 testing window, it declined to 2.1%, producing 32 questions across 58 papers. Peak activity in our collection occurred in 2021 (22 questions in 26 papers) and 2022 (20 questions in 22 papers). Every year since 2019 has featured questions from this chapter, appearing in 104 of the 162 papers in our set.

It constitutes the second half of Unit 10: Oscillations and Waves in NTA's Class 11 syllabus. Its interference mathematics and boundary reflection principles directly prepare students for Wave Optics in Class 12.

Most-asked topics

Between 2019 and 2026, questions separated into four distinct areas:

- **Wave Motion**: 42 questions. Wave speed along stretched cords, transverse wave kinematics, wave equation relations, and speed of sound temperature dependence.
- **Sound Waves**: 32 questions. Standing waves in organ pipes (open and closed ends), end corrections, acoustic resonance tubes, and harmonics.

- **Doppler Effect**: 26 questions. Frequency shifts for moving acoustic sources, moving observers, and echo reflections from stationary or moving walls.
- **Superposition & Standing Waves**: 25 questions. Nodes and antinodes on clamped strings, beats produced by tuning forks, and coherent spatial interference.

Standing waves in acoustic tubes and transverse string waves were tested actively in 2026, while Doppler questions featured regularly through 2023.

What the questions look like

Organ pipe questions evaluate natural acoustic modes. A classic problem states that the difference between the sixth and third harmonics of an open organ pipe equals 2200 Hz and asks for the physical length of the pipe. Students use the open-pipe harmonic formula $f_n = n\,v / (2L)$, setting the frequency gap to $3\,v / (2L)$ and solving for length using the speed of sound. Another frequent variant matches the fifth harmonic of a closed pipe with the fundamental frequency of an open pipe, asking for their length ratio.

String wave problems test transverse propagation speed $v = \sqrt{(T/\mu)}$. A typical question joins two strings of different linear mass densities end-to-end under a shared 500 N tension, asking for the ratio of transit times for pulses initiated at opposite boundaries. Sound velocity questions test gas temperature dependencies, asking for the absolute temperature where sound speed in air doubles relative to its value at 0 °C.

Superposition questions probe beats and interference. A mobile acoustic receiver moves past two coherent speakers separated by a fixed baseline, recording intensity maxima as path differences shift by integer wavelengths. Beats problems evaluate the frequency change when tuning fork prongs are loaded with wax or filed down.

An exceptionally high fraction comes as numerical entry: 50 of the 125 questions since 2019 had no answer options, demanding rigorous unit conversion and arithmetic.

How to practise it

Master boundary conditions for standing waves. Remember that a displacement node occurs at a rigid string clamp or closed organ pipe end (where longitudinal air motion is prevented), whereas an antinode forms at a free string boundary or open organ pipe end (where acoustic pressure matches atmospheric pressure). Open pipes support all integer harmonics (1, 2, 3, ...), whereas closed pipes support only odd harmonics (1, 3, 5, ...).

In string mechanics, memorize that pulse speed depends on tension T and linear mass density μ (mass per unit length). If a string hangs under its own weight, tension varies along its length, so speed increases from bottom to top and calculating transit time requires direct integration.

For sound velocity in gases, apply the Laplace-corrected formula $v = \sqrt{(\gamma RT / M)}$. Notice that sound speed is proportional to the square root of absolute temperature T in Kelvin, but is completely independent of pressure changes at constant temperature because gas density scales proportionally with pressure.

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Q1 JEE Main 2026 · 5 Apr · Shift 1 · Numerical

A transverse wave on a string is described by $y = 3\sin(36t + 0.018x + \pi/4)$. where x, y are in cm and t in seconds. The least distance between the two successive crests in the wave is _____ cm. (Nearest integer)

$(\pi = 3.14)$

Numerical value type: the answer is a number.

Answer: 349. · Official NTA final key

Q2 JEE Main 2026 · 2 Apr · Shift 1 · MCQ

The equation of a plane progressive wave is given by $y = 5\cos\pi\left(200\,t - \frac{x}{150}\right)$ where x and y are in cm and t is in second. The velocity of the wave is _____ m/s.

(A) 120
(B) 150
(C) 200
(D) 300

Answer: (D) 300 · Official NTA final key

Q3 JEE Main 2026 · 28 Jan · Shift 2 · MCQ

The speed of a longitudinal wave in a metallic bar is 400 m/s. If the density and Young's modulus of the bar material are increased by 0.5% and 1%, respectively then the speed of the wave is changed approximately to _____ m/s.

(A) 399
(B) 398
(C) 402
(D) 401

Answer: (D) 401 · Official NTA final key

Q4 JEE Main 2026 · 28 Jan · Shift 2 · Numerical

Two tuning forks A and B are sounded together giving rise to 8 beats in 2 s. When fork A is loaded with wax, the beat frequency is reduced to 4 beats in 2 s. If the original frequency of tuning fork B is 380 Hz then original frequency of tuning fork A is _____ Hz.

Numerical value type: the answer is a number.

Answer: 384. · Official NTA final key

Q5 JEE Main 2026 · 24 Jan · Shift 2 · MCQ

The fifth harmonic of a closed organ pipe is found to be in unison with the first harmonic of an open pipe. The ratio of lengths of closed pipe to that of the open pipe is $5/x$. The value of x is _____.

(A) 2
(B) 3
(C) 4
(D) 1

Answer: (A) 2 · Official NTA final key

Q6 JEE Main 2026 · 24 Jan · Shift 2 MCQ

A point source is kept at the center of a spherically enclosed detector. If the volume of the detector increased by 8 times, the intensity will

(A) increase by 8 times
(B) increase by 64 times
(C) decrease by 4 times
(D) decrease by 8 times

Answer: (C) decrease by 4 times · Official NTA final key

Q7 JEE Main 2026 · 23 Jan · Shift 2 Numerical

The velocity of sound in air is doubled when the temperature is raised from 0 °C to α °C. The value of α is _____.

Numerical value type: the answer is a number.

Answer: 819. · Official NTA final key

Q8 JEE Main 2026 · 22 Jan · Shift 1 Numerical

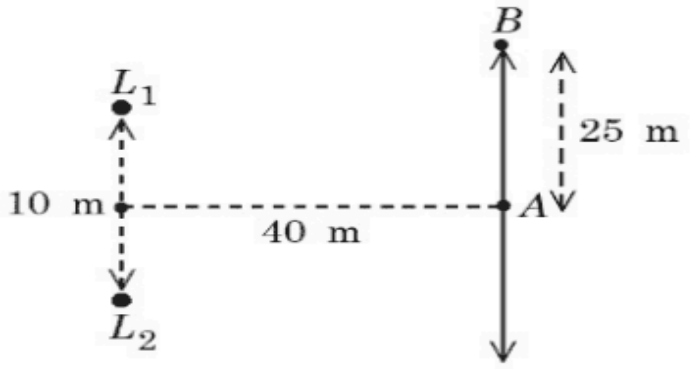
Two loudspeakers (L_1 and L_2) are placed with a separation of 10 m, as shown in figure. Both speakers are fed with an audio input signal of same frequency with constant volume. A voice recorder, initially at point A, at equidistance to both loud speakers, is moved by 25 m along the line AB while monitoring the audio signal. The measured signal was found to undergo 10 cycles of minima and maxima during the movement. The frequency of the input signal is _____ Hz

(Speed of sound in air is 324 m/s and $\sqrt{5} = 2.23$)

(see the figure above)

Q.50

Two loudspeakers (L_1 and L_2) are placed with a separation of 10 m, as shown in figure. Both speakers are fed with an audio input signal of same frequency with constant volume. A voice recorder, initially at point A, at equidistance to both loud speakers, is moved by 25 m along the line AB while monitoring the audio signal. The measured signal was found to undergo 10 cycles of minima and maxima during the movement. The frequency of the input signal is _____Hz
(Speed of sound in air is 324 m/s and $\sqrt{5} = 2.23$)



Numerical value type: the answer is a number.

Answer: 600. · Official NTA final key

Q9 JEE Main 2026 · 22 Jan · Shift 2 MCQ

In an open organ pipe ν_3 and ν_6 are 3rd and 6th harmonic frequencies, respectively. If $\nu_6 - \nu_3 = 2200$ Hz then length of the pipe is _____ mm.

(Take velocity of sound in air is 330 m/s.)

(A) 200
(B) 225
(C) 250
(D) 275

Answer: (B) 225 · Official NTA final key

Q10 JEE Main 2026 · 21 Jan · Shift 1 MCQ

Two strings (A, B) having linear densities $\mu_A = 2 \times 10^{-4}$ kg/m and, $\mu_B = 4 \times 10^{-4}$ kg/m and lengths $L_A = 2.5$ m and $L_B = 1.5$ m respectively are joined. Free ends of A and B are tied to two rigid supports C and D, respectively creating a tension of 500 N in the wire. Two identical pulses, sent from C and D ends, take time t_1 and t_2, respectively, to reach the joint. The ratio t_1/t_2 is :

(A) 1.08
(B) 1.90
(C) 1.18
(D) 1.67

Answer: (C) 1.18 · Official NTA final key

Q11 JEE Main 2025 · 8 Apr · Shift 2 MCQ

The amplitude and phase of a wave that is formed by the superposition of two harmonic travelling waves, $y_1(x,t) = 4\sin(kx - \omega t)$ and $y_2(x,t) = 2\sin\left(kx - \omega t + \frac{2\pi}{3}\right)$, are:

(Take the angular frequency of initial waves same as ω)

(A) $[\sqrt{3}, \pi/6]$
(B) $[2\sqrt{3}, \pi/6]$
(C) $[6, \pi/3]$
(D) $[6, 2\pi/3]$

Answer: (B) $[2\sqrt{3}, \pi/6]$ · Key from source paper

Q12 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Two strings with circular cross section and made of same material, are stretched to have same amount of tension. A transverse wave is then made to pass through both the strings. The velocity of the wave in the first string having the radius of cross section R is v_1, and that in the other string having radius of cross section $R/2$ is v_2. Then $\frac{v_2}{v_1} =$

(A) 8
(B) 4
(C) $\sqrt{2}$
(D) 2

Answer: (D) 2 · Key from source paper

Q13 JEE Main 2025 · 7 Apr · Shift 1 MCQ

Two harmonic waves moving in the same direction superimpose to form a wave $x = a\cos(1.5t)\cos(50.5t)$ where t is in seconds. Find the period with which they beat. (close to nearest integer)

(A) 1 s
(B) 2 s
(C) 6 s
(D) 4 a

Answer: (B) 2 s · Key from source paper

Q14 JEE Main 2025 · 7 Apr · Shift 2 MCQ

The equation of a wave travelling on a string is $y = \sin[20\pi x + 10\pi t]$, where x and t are distance and time in SI units. The minimum distance between two points having the same oscillating speed is :

(A) 5.0 cm
(B) 20 cm
(C) 10 cm
(D) 2.5 cm

Answer: (A) 5.0 cm · Key from source paper

Q15 JEE Main 2025 · 4 Apr · Shift 1 MCQ

Consider the sound wave travelling in ideal gases of He, CH_4, and CO_2. All the gases have the same ratio $\frac{P}{\rho}$, where P is the pressure and ρ is the density. The ratio of the speed of sound through the gases $V_{He} : V_{CH_4} : V_{CO_2}$ is given by

(A) $\sqrt{\frac{7}{5}} : \sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}}$
(B) $\sqrt{\frac{4}{3}} : \sqrt{\frac{5}{3}} : \sqrt{\frac{7}{5}}$
(C) $\sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}} : \sqrt{\frac{4}{3}}$
(D) $\sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}} : \sqrt{\frac{7}{5}}$

Answer: (C) $\sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}} : \sqrt{\frac{4}{3}}$ · Key from source paper

Q16 JEE Main 2025 · 4 Apr · Shift 1 MCQ

In an experiment with a closed organ pipe, it is filled with water by $\left(\frac{1}{5}\right)$th of its volume. The frequency of the fundamental note will change by

(A) 25%
(B) 20%
(C) –25%
(D) –20%

Answer: (A) 25% · Key from source paper

Q17 JEE Main 2025 · 4 Apr · Shift 2 MCQ

Displacement of a wave is expressed as $x(t) = 5\cos\left(628t + \frac{\pi}{2}\right) m$. The wavelength of the wave when its velocity is $300 m/s$ is :

$(\pi = 3.14)$

(A) 0.33 m
(B) 0.5 m
(C) 3 m
(D) 5 m

Answer: (C) 3 m · Key from source paper

Q18 JEE Main 2025 · 3 Apr · Shift 2 MCQ

In the resonance experiment, two air columns (closed at one end) of 100 cm and 120 cm long, give 15 beats per second when each one is sounding in the respective fundamental modes. The velocity of sound in the air column is:

(A) $340 m/s$
(B) $370 m/s$
(C) $360 m/s$
(D) $335 m/s$

Answer: (C) $360 m/s$ · Key from source paper

Q19 JEE Main 2025 · 2 Apr · Shift 2 MCQ

A sinusoidal wave of wavelength 7.5 cm travels a distance of 1.2 cm along the x -direction in 0.3 sec. The crest P is at $x = 0$ at $t = 0 sec$ and maximum displacement of the wave is 2 cm. Which equation correctly represents this wave ?

(A) $y = 2\cos(0.83x - 3.35t) cm$
(B) $y = 2\cos(0.13x - 0.5t) cm$
(C) $y = 2\sin(0.83x - 3.5t) cm$
(D) $y = 2\cos(3.35x - 0.83t) cm$

Answer: (A) $y = 2\cos(0.83x - 3.35t) cm$ · Key from source paper

Q20 JEE Main 2025 · 28 Jan · Shift 1 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason **R** Assertion A: A sound wave has higher speed in solids than gases. Reason R: Gases have higher value of Bulk modulus than solids. In the light of the above statements, choose the correct answer from the options given below

(A) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
(B) **A** is true but **R** is false
(C) **A** is false but **R** is true
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**

Answer: (B) A is true but R is false · Key from source paper

Q21 JEE Main 2025 · 23 Jan · Shift 2 MCQ

The equation of a transverse wave travelling along a string is $y(x,t) = 4.0\sin\left[20 \times 10^{-3}x + 600t\right]$ mm, where x is in mm and t is in second. The velocity of the wave is :

(A) -60 m/s
(B) -30 m/s
(C) $+30$ m/s
(D) $+60$ m/s

Answer: (B) -30 m/s · Key from source paper

Q22 JEE Main 2025 · 22 Jan · Shift 1 MCQ

A closed organ and an open organ tube are filled by two different gases having same bulk modulus but different densities ρ_1 and ρ_2, respectively. The frequency of 9th harmonic of closed tube is identical with 4th harmonic of open tube. If the length of the closed tube is 10 cm and the density ratio of the gases is $\rho_1 : \rho_2 = 1 : 16$, then the length of the open tube is :

(A) $\frac{15}{7}$ cm
(B) $\frac{20}{7}$ cm
(C) $\frac{15}{9}$ cm
(D) $\frac{20}{9}$ cm

Answer: (D) $\frac{20}{9}$ cm · Key from source paper

Q23 JEE Main 2024 · 8 Apr · Shift 1 Numerical

A closed and an open organ pipe have same lengths. If the ratio of frequencies of their seventh overtones is $\left(\frac{a-1}{a}\right)$ then the value of a is _____

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q24 JEE Main 2024 · 8 Apr · Shift 2 MCQ

A plane progressive wave is given by $y = 2\cos 2\pi(330t - x)$m. The frequency of the wave is :

(A) 330 Hz
(B) 660 Hz
(C) 340 Hz
(D) 165 Hz

Answer: (A) 330 Hz · Key from source paper

Q25 JEE Main 2024 · 6 Apr · Shift 2 Numerical

Two open organ pipes of lengths 60 cm and 90 cm resonate at 6th and 5th harmonics respectively. The difference of frequencies for the given modes is _____ Hz. (Velocity of sound in air = 333 m/s)

Numerical value type: the answer is a number.

Answer: 740. · Key from source paper

Q26 JEE Main 2024 · 5 Apr · Shift 2 Numerical

A sonometer wire of resonating length 90 cm has a fundamental frequency of 400 Hz when kept under some tension. The resonating length of the wire with fundamental frequency of 600 Hz under same tension _____ cm .

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q27 JEE Main 2024 · 1 Feb · Shift 1 Numerical

A tuning fork resonates with a sonometer wire of length 1 m stretched with a tension of 6 N. When the tension in the wire is changed to 54 N, the same tuning fork produces 12 beats per second with it. The frequency of the tuning fork is _____ Hz.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q28 JEE Main 2024 · 31 Jan · Shift 1 MCQ

The fundamental frequency of a closed organ pipe is equal to the first overtone frequency of an open organ pipe. If length of the open pipe is 60 cm, the length of the closed pipe will be :

(A) 60 cm
(B) 45 cm
(C) 30 cm
(D) 15 cm

Answer: (D) 15 cm · Key from source paper

Q29 JEE Main 2024 · 31 Jan · Shift 2 MCQ

The speed of sound in oxygen at S.T.P. will be approximately:
(Given, $R = 8.3\ \text{J K}^{-1}$, $\gamma = 1.4$)

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(A) $310\ \mathrm{m\ s^{-1}}$
(B) $333\ \mathrm{m\ s^{-1}}$
(C) $341\ \mathrm{m\ s^{-1}}$
(D) $325\ \mathrm{m\ s^{-1}}$

Answer: (A) $310\ \mathrm{m\ s^{-1}}$ · Key from source paper

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Q30 JEE Main 2024 · 30 Jan · Shift 1 Numerical

In a closed organ pipe, the frequency of fundamental note is 30 Hz. A certain amount of water is now poured in the organ pipe so that the fundamental frequency is increased to 110 Hz. If the organ pipe has a cross-sectional area of 2 $\mathrm{cm^2}$, the amount of water poured in the organ tube is _____ g. (Take speed of sound in air is 330 m $\mathrm{s^{-1}}$)

Numerical value type: the answer is a number.

Answer: 400. · Key from source paper

Q31 JEE Main 2024 · 30 Jan · Shift 2 Numerical

A point source is emitting sound waves of intensity $16 \times 10^{-8}\ \mathrm{W\,m^{-2}}$ at the origin. The difference in intensity (magnitude only) at two points located at a distances of 2 m and 4 m from the origin respectively will be _____ $\times 10^{-8}\ \mathrm{W\,m^{-2}}$.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q32 JEE Main 2024 · 27 Jan · Shift 2 Numerical

A closed organ pipe 150 cm long gives 7 beats per second with an open organ pipe of length 350 cm, both vibrating in fundamental mode. The velocity of sound is _____ m $\mathrm{s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 294. · Key from source paper

Q33 JEE Main 2023 · 15 Apr · Shift 1 Numerical

The fundamental frequency of vibration of a string between two rigid support is 50 Hz. The mass of the string is 18 g and its linear mass density is 20 g $\mathrm{m^{-1}}$. The speed of the transverse waves so produced in the string is _____ m $\mathrm{s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 90. · Key from source paper

Q34 JEE Main 2023 · 13 Apr · Shift 2 Numerical

In an experiment with sonometer when a mass of 180 g is attached to the string, it vibrates with fundamental frequency of 30 Hz. When a mass m is attached, the string vibrates with fundamental

frequency of 50 Hz. The value of m is _____ g.

Numerical value type: the answer is a number.

Answer: 500. · Key from source paper

Q35 JEE Main 2023 · 12 Apr · Shift 1 Numerical

For a certain organ pipe, the first three resonance frequencies are in the ratio of $1 : 3 : 5$ respectively. If the frequency of fifth harmonic is 405 Hz and the speed of sound in air is $324\ \mathrm{m\ s^{-1}}$ the length of the organ pipe is _____ m.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q36 JEE Main 2023 · 11 Apr · Shift 1 Numerical

The equation of wave is given by $Y = 10^{-2} \sin 2\pi 160t - 0.5x + \frac{\pi}{4}$, where x and Y are in m and t in s. The speed of the wave is _____ $\mathrm{km\ h^{-1}}$.

Numerical value type: the answer is a number.

Answer: 1152. · Key from source paper

Q37 JEE Main 2023 · 11 Apr · Shift 2 MCQ

A car P travelling at $20\ \mathrm{m\ s^{-1}}$ sounds its horn at a frequency of 400 Hz. Another car Q is travelling behind the first car in the same direction with a velocity $40\ \mathrm{m\ s^{-1}}$. The frequency heard by the passenger of the car Q is approximately [Take, velocity of sound $= 360\ \mathrm{m\ s^{-1}}$]

(A) 421 Hz
(B) 471 Hz
(C) 485 Hz
(D) 514 Hz

Answer: (A) 421 Hz · Checked by our team

Q38 JEE Main 2023 · 11 Apr · Shift 2 Numerical

A wire of density $8 \times 10^3\ \mathrm{kg\ m^{-3}}$ is stretched between two clamps 0.5 m apart. The extension developed in the wire is 3.2×10^{-4} m. If $Y = 8 \times 10^{10}\ \mathrm{N\ m^{-2}}$, the fundamental frequency of vibration in the wire will be _____ Hz

Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

Q39 JEE Main 2023 · 10 Apr · Shift 1 Numerical

A transverse harmonic wave on a string is given by $yx, t = 5\ \sin 6t + 0.003x$ where x and y are in cm and t in sec. The wave velocity is _____ $\mathrm{m\ s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q40 JEE Main 2023 · 8 Apr · Shift 1 MCQ

The engine of a train moving with speed $10\ \mathrm{m\,s^{-1}}$ towards a platform sounds a whistle at frequency 400 Hz. The frequency heard by a passenger inside the train is: (Neglect air speed. Speed of sound in air $= 330\ \mathrm{m\,s^{-1}}$)

(A) 400 Hz
(B) 200 Hz
(C) 412 Hz
(D) 388 Hz

Answer: (A) 400 Hz · Key from source paper

Q41 JEE Main 2023 · 8 Apr · Shift 1 Numerical

An organ pipe 40 cm long is open at both ends. The speed of sound in air is $360\ \mathrm{m\,s^{-1}}$. The frequency of the second harmonic is _____ Hz.

Numerical value type: the answer is a number.

Answer: 900. · Key from source paper

Q42 JEE Main 2023 · 8 Apr · Shift 2 Numerical

A guitar string of length $90\ \mathrm{cm}$ vibrates with a fundamental frequency of $120\ \mathrm{Hz}$. The length of the string producing a fundamental of $180\ \mathrm{Hz}$ will be _____ cm

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q43 JEE Main 2023 · 6 Apr · Shift 1 Numerical

A person driving car at a constant speed of $15\ \mathrm{m\ s^{-1}}$ is approaching a vertical wall. The person notices a change of $40\ \mathrm{Hz}$ in the frequency of his car's horn upon reflection from the wall. The frequency of horn is _____ Hz.
(Given: Speed of sound: $30\ \mathrm{m\ s^{-1}}$)

Numerical value type: the answer is a number.

Answer: 420. · Key from source paper

Q44 JEE Main 2023 · 6 Apr · Shift 2 MCQ

The ratio of speed of sound in hydrogen gas to the speed of sound in oxygen gas at the same temperature is:

(A) $1 : 2$
(B) $4 : 1$
(C) $1 : 4$
(D) $1 : 1$

Answer: (B) $4 : 1$ · Key from source paper

Q45 JEE Main 2023 · 1 Feb · Shift 1 MCQ

A steel wire with mass per unit length $7.0 \times 10^{-3}\ \mathrm{kg\ m^{-1}}$ is under tension of 70 N. The speed of transverse waves in the wire will be:

(A) $200\pi\ \mathrm{m\ s^{-1}}$
(B) $100\ \mathrm{m\ s^{-1}}$
(C) $10\ \mathrm{m\ s^{-1}}$
(D) $50\ \mathrm{m\ s^{-1}}$

Answer: (B) $100\ \mathrm{m\ s^{-1}}$ · Key from source paper

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Q46 JEE Main 2023 · 31 Jan · Shift 2 MCQ

For a solid rod, the Young's modulus of elasticity is 3.2×10^{11} N m^{-2} and density is 8×10^{3} kg m^{-3}. The velocity of longitudinal wave in the rod will be

(A) 145.75×10^{3} m s^{-1}
(B) 3.65×10^{3} m s^{-1}
(C) 18.96×10^{3} m s^{-1}
(D) 6.32×10^{3} m s^{-1}

Answer: (D) 6.32×10^{3} m s^{-1} · Key from source paper

Q47 JEE Main 2023 · 31 Jan · Shift 2 Numerical

The displacement equations of two interfering waves are given by $y_1 = 10\ \sin\left(\omega t + \frac{\pi}{3}\right)$ cm, $y_2 = 5\left[\sin\left(\omega t\right) + \sqrt{3}\ \cos\ \omega t\right]$ cm respectively. The amplitude of the resultant wave is _____ cm.

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q48 JEE Main 2023 · 29 Jan · Shift 1 Numerical

Two simple harmonic waves having equal amplitudes of $8\ \mathrm{cm}$ and equal frequency of $10\ \mathrm{Hz}$ are moving along the same direction. The resultant amplitude is also $8\ \mathrm{cm}$. The phase difference between the individual waves is _____ degree.

Numerical value type: the answer is a number.

Answer: 120. · Key from source paper

Q49 JEE Main 2023 · 29 Jan · Shift 1 MCQ

A person observes two moving trains, A reaching the station and B leaving the station with equal speed of $30\ \mathrm{m\,s^{-1}}$. If both trains emit sounds with frequency $300\ \mathrm{Hz}$, (Speed of sound : $330\ \mathrm{m\,s^{-1}}$) approximate difference of frequencies heard by the person will be :

(A) $33\ \mathrm{Hz}$
(B) $55\ \mathrm{Hz}$
(C) $80\ \mathrm{Hz}$
(D) $10\ \mathrm{Hz}$

Answer: (B) $55\ \mathrm{Hz}$ · Key from source paper

Q50 JEE Main 2023 · 25 Jan · Shift 1 Numerical

The distance between two consecutive points with phase difference of 60° in a wave of frequency $500\ \mathrm{Hz}$ is $6.0\ \mathrm{m}$. The velocity with which wave is travelling is _____ $\mathrm{km\,s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 18. · Key from source paper

Q51 JEE Main 2023 · 25 Jan · Shift 2 Numerical

A train blowing a whistle of frequency 320 Hz approaches an observer standing on the platform at a speed of $66\ \mathrm{m\,s^{-1}}$. The frequency observed by the observer will be (given speed of sound $= 330\ \mathrm{m\,s^{-1}}$) _____ Hz.

Numerical value type: the answer is a number.

Answer: 400. · Key from source paper

Q52 JEE Main 2023 · 24 Jan · Shift 1 MCQ

A travelling wave is described by the equation $y(x,t) = 0.05\sin(8x - 4t)$ m. The velocity of the wave is:

[All the quantities are in SI unit]

(A) $4\ \mathrm{m\,s^{-1}}$
(B) $2\ \mathrm{m\,s^{-1}}$
(C) $0.5\ \mathrm{m\,s^{-1}}$
(D) $8\ \mathrm{m\,s^{-1}}$

Answer: (C) $0.5\ \mathrm{m\,s^{-1}}$ · Key from source paper

Q53 JEE Main 2022 · 29 Jul · Shift 2 Numerical

The speed of a transverse wave passing through a string of length 50 cm and mass 10 g is $60\ \mathrm{m\ s^{-1}}$. The area of cross-section of the wire is 2.0 $\mathrm{mm^2}$ and its Young's modulus is $1.2 \times 10^{11}\ \mathrm{N\ m^{-2}}$. The

extension of the wire over its natural length due to its tension will be $x \times 10^{-5}$ m. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q54 JEE Main 2022 · 28 Jul · Shift 1 MCQ

In the wave equation $y = 0.5 \sin \frac{2\pi}{\lambda} 400t - xm$ the velocity of the wave will be :

(A) $200\ \mathrm{m\ s^{-1}}$

(B) $200\sqrt{2}\ \mathrm{m\ s^{-1}}$

(C) $400\ \mathrm{m\ s^{-1}}$

(D) $400\sqrt{2}\ \mathrm{m\ s^{-1}}$

Answer: (C) $400\ \mathrm{m\ s^{-1}}$ · Key from source paper

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Q55 JEE Main 2022 · 28 Jul · Shift 1 Numerical

The frequency of echo will be _____ Hz if the train blowing a whistle of frequency $320\ \mathrm{Hz}$ is moving with a velocity of $36\ \mathrm{km\ h^{-1}}$ towards a hill from which an echo is heard by the train driver. Velocity of sound in air is $330\ \mathrm{m\ s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 340. · Key from source paper

Q56 JEE Main 2022 · 27 Jul · Shift 2 Numerical

A wire of length 30 cm, stretched between rigid supports, has it's n^{th} and $(n+1)^{\mathrm{th}}$ harmonics at 400 Hz and 450 Hz, respectively. If tension in the string is 2700 N, it's linear mass density is _____ $\mathrm{kg\ m^{-1}}$.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q57 JEE Main 2022 · 26 Jul · Shift 1 Numerical

When a car is approaching the observer, the frequency of horn is 100 Hz. After passing the observer, it is 50 Hz. If the observer moves with the car, the frequency will be $\frac{x}{3}$ Hz where x = _____ .

Numerical value type: the answer is a number.

Answer: 200. · Key from source paper

Q58 JEE Main 2022 · 26 Jul · Shift 2 MCQ

A transverse wave is represented by $y = 2 \sin \omega t - kx$cm. The value of wavelength (in cm) for which the wave velocity becomes equal to the maximum particle velocity, will be

(A) 4π
(B) 2π
(C) π
(D) 2

Answer: (A) 4π · Key from source paper

Q59 JEE Main 2022 · 25 Jul · Shift 1 Numerical

An observer is riding on a bicycle and moving towards a hill at 18 $\mathrm{km\ h^{-1}}$. He hears a sound from a source at some distance behind him directly as well as after its reflection from the hill. If the original frequency of the sound as emitted by source is 640 Hz and velocity of the sound in air is 320 $\mathrm{m\ s^{-1}}$, the beat frequency between the two sounds heard by observer will be _____ Hz.

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q60 JEE Main 2022 · 25 Jul · Shift 2 Numerical

Two waves executing simple harmonic motion travelling in the same direction with same amplitude and frequency are superimposed. The resultant amplitude is equal to the $\sqrt{3}$ times of amplitude of individual motions. The phase difference between the two motions is _____ (degree)

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q61 JEE Main 2022 · 29 Jun · Shift 1 MCQ

A longitudinal wave is represented by $y = 10\sin 2\pi\left(nt - \frac{x}{\lambda}\right)$ cm. The maximum particle velocity will be four times the wave velocity if the determined value of wavelength is equal to

(A) 2π
(B) 5π
(C) π
(D) $\frac{5\pi}{2}$

Answer: (B) 5π · Key from source paper

Q62 JEE Main 2022 · 29 Jun · Shift 2 Numerical

In an experiment to determine the velocity of sound in air at room temperature using a resonance tube, the first resonance is observed when the air column has a length of 20.0 cm for a tuning fork of frequency 400 Hz is used. The velocity of the sound at room temperature is $336\ \mathrm{m\ s^{-1}}$. The third resonance is observed when the air column has a length of _____ cm

Numerical value type: the answer is a number.

Answer: 104. · Key from source paper

Q63 JEE Main 2022 · 28 Jun · Shift 1 MCQ

The velocity of sound in a gas, in which two wavelengths $4.08\ \mathrm{m}$ and $4.16\ \mathrm{m}$ produce 40 beats in $12\ \mathrm{s}$, will be

(A) $282.8\ \mathrm{m\,s^{-1}}$
(B) $175.5\ \mathrm{m\,s^{-1}}$
(C) $353.6\ \mathrm{m\,s^{-1}}$
(D) $707.2\ \mathrm{m\,s^{-1}}$

Answer: (D) $707.2\ \mathrm{m\,s^{-1}}$ · Key from source paper

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Q64 JEE Main 2022 · 28 Jun · Shift 2 Numerical

A tunning fork of frequency $340\ \mathrm{Hz}$ resonates in the fundamental mode with an air column of length $125\ \mathrm{cm}$ in a cylindrical tube closed at one end. When water is slowly poured in it, the minimum height of water required for observing resonance once again is _____ cm.
(Velocity of sound in air is $340\ \mathrm{ms^{-1}}$)

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q65 JEE Main 2022 · 27 Jun · Shift 1 MCQ

An observer moves towards a stationary source of sound with a velocity one-fifth of the velocity of sound. The percentage change in the apparent frequency is

(A) zero
(B) 5%
(C) 10%
(D) 20%

Answer: (D) 20% · Key from source paper

Q66 JEE Main 2022 · 27 Jun · Shift 2 MCQ

If a wave gets refracted into a denser medium, then which of the following is true?

(A) Wavelength, speed and frequency decreases.
(B) Wavelength increases, speed decreases and frequency remains constant.
(C) Wavelength and speed decreases but frequency remains constant.
(D) Wavelength, speed and frequency increases.

Answer: (C) Wavelength and speed decreases but frequency remains constant. · Key from source paper

EdLoop JEE

Q67 JEE Main 2022 · 26 Jun · Shift 2 MCQ

For a specific wavelength $670\ \text{nm}$ of light coming from a galaxy moving with velocity v, the observed wavelength is $670.7\ \text{nm}$. The value of v is

(A) $3 \times 10^{8}\ \text{m s}^{-1}$
(B) $3.13 \times 10^{5}\ \text{m s}^{-1}$
(C) $3 \times 10^{10}\ \text{m s}^{-1}$
(D) $4.48 \times 10^{5}\ \text{m s}^{-1}$

Answer: (B) $3.13 \times 10^{5}\ \text{m s}^{-1}$ · Key from source paper

Q68 JEE Main 2022 · 26 Jun · Shift 2 Numerical

A set of 20 tuning forks is arranged in a series of increasing frequencies. If each fork gives 4 beats with respect to the preceding fork and the frequency of the last fork is twice the frequency of the first, then the frequency of last fork is _____ Hz.

Numerical value type: the answer is a number.

Answer: 152. · Key from source paper

Q69 JEE Main 2022 · 25 Jun · Shift 1 Numerical

The first overtone frequency of an open organ pipe is equal to the fundamental frequency of a closed organ pipe. If the length of the closed organ pipe is $20\ \text{cm}$. The length of the open organ pipe is _____ cm

Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

Q70 JEE Main 2022 · 24 Jun · Shift 1 MCQ

The equations of two waves are given by :
$y_1 = 5 \sin 2\pi(x - vt)\ \text{cm}$
$y_2 = 3 \sin 2\pi(x - vt + 1.5)\ \text{cm}$
These waves are simultaneously passing through a string. The amplitude of the resulting wave is :

(A) $2\ \text{cm}$
(B) $4\ \text{cm}$
(C) $5.8\ \text{cm}$
(D) $8\ \text{cm}$

Answer: (A) $2\ \text{cm}$ · Key from source paper

Q71 JEE Main 2022 · 24 Jun · Shift 2 Numerical

Two travelling waves of equal amplitudes and equal frequencies move in opposite directions along a string. They interfere to produce a stationary wave whose equation is given by $y = \left(10 \cos \pi x \sin \frac{2\pi t}{T}\right)$

cm. The amplitude of the particle at $x = \frac{4}{3}$ cm will be _____ cm.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q72 JEE Main 2021 · 31 Aug · Shift 1 Numerical

A wire having a linear mass density 9.0×10^{-4} kg m^{-1} is stretched between two rigid supports with a tension of 900 N. The wire resonates at a frequency of 500 Hz. The next higher frequency at which the same wire resonates is 550 Hz. The length of the wire is _____ m.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q73 JEE Main 2021 · 27 Aug · Shift 1 Numerical

Two cars X and Y are approaching each other with velocities 36 km h^{-1} and 72 km h^{-1} respectively. The frequency of a whistle sound as emitted by a passenger in car X, heard by the passenger in car Y is 1320 Hz. If the velocity of sound in air is 340 ms^{-1}, the actual frequency of the whistle sound produced is _____ Hz.

Numerical value type: the answer is a number.

Answer: 1210. · Key from source paper

Q74 JEE Main 2021 · 27 Aug · Shift 2 Numerical

A tuning fork is vibrating at $250\ \mathrm{Hz}$. The length of the shortest closed organ pipe that will resonate with the tuning fork will be _____cm. (Take speed of sound in air as $340\ \mathrm{m\ s^{-1}}$)

Numerical value type: the answer is a number.

Answer: 34. · Key from source paper

Q75 JEE Main 2021 · 26 Aug · Shift 1 Numerical

Two travelling waves produces a standing wave represented by equation.
$y = (1.0\ \mathrm{mm}) \cos\left[\left(1.57\ \mathrm{cm^{-1}}\right) x\right] \sin\left[\left(78.5\ \mathrm{s^{-1}}\right) t\right]$. The node closest to the origin in the region $x > 0$ will be at $x =$ ..... (in cm).

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q76 JEE Main 2021 · 26 Aug · Shift 1 Numerical

A source and a detector move away from each other in absence of wind with a speed of $20\ \mathrm{m\ s^{-1}}$, with respect to the ground. If the detector detects a frequency of $1800\ \mathrm{Hz}$ of the sound coming from the source, then the original frequency of source considering the speed of sound in the air $340\ \mathrm{m\ s^{-1}}$ will be _____ Hz.

Numerical value type: the answer is a number.

Answer: 2025. · Key from source paper

Q77 JEE Main 2021 · 26 Aug · Shift 2 Numerical

Two waves are simultaneously passing through a string and their equations are : $y_1 = A_1 \sin k(x - vt)$, $y_2 = A_2 \sin k(x - vt + x_0)$. Given amplitudes $A_1 = 12$ mm and $A_2 = 5$ mm, $x_0 = 3.5$ cm and wave number $\mathrm{k} = 6.28\ \mathrm{cm}^{-1}$. The amplitude of resulting wave will be _____ mm.

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q78 JEE Main 2021 · 20 Jul · Shift 1 Numerical

The amplitude of wave disturbance propagating in the positive x-direction is given by $y = \frac{1}{(1+x)^2}$ at time $t = 0$ and $y = \frac{1}{1+(x-2)^2}$ at $t = 1$ s, where x and y are in metres. The shape of wave does not change during the propagation. The velocity of the wave will be $\mathrm{m\ s^{-1}}$.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q79 JEE Main 2021 · 20 Jul · Shift 1 Numerical

The frequency of a car horn encountered a change from 400 Hz to 500 Hz. When the car approaches a vertical wall. If the speed of sound is $330\ \mathrm{m\ s^{-1}}$. Then the speed of car is ___ $\mathrm{km\ h^{-1}}$.

Numerical value type: the answer is a number.

Answer: 132. · Key from source paper

Q80 JEE Main 2021 · 20 Jul · Shift 2 MCQ

With what speed should a galaxy move outward with respect to earth so that the sodium-D line at wavelength 5890 Å is observed at 5896 Å?

(A) $306\ \mathrm{km\ sec^{-1}}$
(B) $322\ \mathrm{km\ sec^{-1}}$
(C) $296\ \mathrm{km\ sec^{-1}}$
(D) $336\ \mathrm{km\ sec^{-1}}$

Answer: (A) $306\ \mathrm{km\ sec^{-1}}$ · Key from source paper

Q81 JEE Main 2021 · 18 Mar · Shift 2 Numerical

A galaxy is moving away from the earth at a speed of $286\ \mathrm{km\ s^{-1}}$. The shift in the wavelength of a red line at 630 nm is $x \times 10^{-10}$ m. The value of x, to the nearest integer, is _____ .
[Take the value of the speed of the light c, as $3 \times 10^8\ \mathrm{m\ s^{-1}}$]

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q82 JEE Main 2021 · 17 Mar · Shift 2 MCQ

A sound wave of frequency 245 Hz travels with the speed of $300\ \mathrm{m\ s^{-1}}$ along the positive x-axis. Each point of the wave moves to and fro through a total distance of $6\ \mathrm{cm}$. What will be the mathematical expression of this travelling wave?

(A) $Y(x,t) = 0.03\left[\sin 5.1x - \left(0.2\times 10^3\right)t\right]$

(B) $Y(x,t) = 0.06\left[\sin 5.1x - \left(1.5\times 10^3\right)t\right]$

(C) $Y(x,t) = 0.06\left[\sin 0.8x - \left(0.5\times 10^3\right)t\right]$

(D) $Y(x,t) = 0.03\left[\sin 5.1x - \left(1.5\times 10^3\right)t\right]$

Answer: (D) $Y(x,t) = 0.03\left[\sin 5.1x - \left(1.5\times 10^3\right)t\right]$ · Key from source paper

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Q83 JEE Main 2021 · 16 Mar · Shift 2 Numerical

A closed organ pipe of length L and an open organ pipe contain gases of densities ρ_1 and ρ_2 respectively. The compressibility of gases are equal in both the pipes. Both the pipes are vibrating in their first overtone with same frequency. The length of the open pipe is $\frac{x}{3}L\sqrt{\frac{\rho_1}{\rho_2}}$, where x is _____.

(Round off to the Nearest Integer)

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q84 JEE Main 2021 · 26 Feb · Shift 1 Numerical

The mass per unit length of a uniform wire is $0.135\ \mathrm{g\ cm^{-1}}$. A transverse wave of the form $y = -0.21\sin(x+30t)$ is produced in it, where x is in meter and t is in second. Then, the expected value of tension in the wire is $x\times 10^{-2}$ N. Value of x is _____ (Round-off to the nearest integer)

Numerical value type: the answer is a number.

Answer: 1215. · Key from source paper

Q85 JEE Main 2021 · 26 Feb · Shift 2 MCQ

A tuning fork A of unknown frequency produces 5 beats $\mathrm{s^{-1}}$ with a fork of known frequency $340\ \mathrm{Hz}$. When fork A is filed, the beat frequency decreases to 2 beats $\mathrm{s^{-1}}$. What is the frequency of fork A ?

(A) $335\ \mathrm{Hz}$

(B) $338\ \mathrm{Hz}$

(C) $345\ \mathrm{Hz}$

(D) $342\ \mathrm{Hz}$

Answer: (A) $335\ \mathrm{Hz}$ · Key from source paper

Q86 JEE Main 2021 · 25 Feb · Shift 1 MCQ

A student is performing the experiment of the resonance column. The diameter of the column tube is $6\ \text{cm}$. The frequency of the tuning fork is $504\ \text{Hz}$. Speed of the sound at the given temperature is $336\ \text{m s}^{-1}$. The zero of the meter scale coincides with the top end of the resonance column tube. The reading of the water level in the column when the first resonance occurs is:

(A) $14.8\ \text{cm}$
(B) $18.4\ \text{cm}$
(C) $16.6\ \text{cm}$
(D) $13\ \text{cm}$

Answer: (A) $14.8\ \text{cm}$ · Key from source paper

Q87 JEE Main 2021 · 25 Feb · Shift 2 Numerical

The percentage increase in the speed of transverse waves produced in a stretched string if the tension is increased by 4%, will be _____ $\%$.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q88 JEE Main 2021 · 24 Feb · Shift 2 MCQ

Which of the following equations represents a travelling wave?

(A) $y = A\sin(15x - 2t)$
(B) $y = Ae^{x}\cos(\omega t - \theta)$
(C) $y = Ae^{-x^2}(vt + \theta)$
(D) $y = A\sin x\ \cos\omega t$

Answer: (A) $y = A\sin(15x - 2t)$ · Key from source paper

Q89 JEE Main 2021 · 24 Feb · Shift 2 Numerical

Two cars are approaching each other at an equal speed of $7.2\ \text{km hr}^{-1}$. When they see each other, both blow horns having a frequency of $676\ \text{Hz}$. The beat frequency heard by each driver will be _____ Hz. [Velocity of sound in air is $340\ \text{m s}^{-1}$.

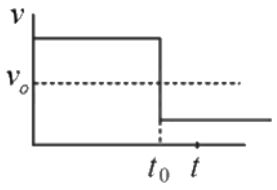
Numerical value type: the answer is a number.

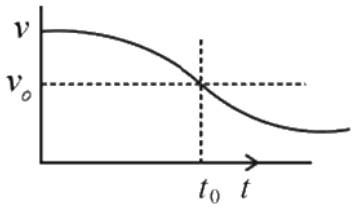
Answer: 8. · Key from source paper

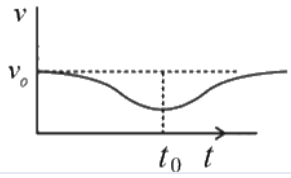
Q90 JEE Main 2020 · 6 Sep · Shift 1 MCQ

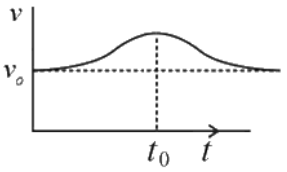
A sound source S is moving along a straight track with speed v, and is emitting sound of frequency v_0 .An observer is standing at a finite distance, at the point O, from the track. The time variation of frequency heard by observer is best represented by : (t_0 represents the instant when the distance between the source and observer is minimum)

Q9. A sound source S is moving along a straight track with speed v, and is emitting sound of frequency v_0.An observer is standing at a finite distance, at the point O, from the track. The time variation of frequency heard by observer is best represented by : (to represents the instant when the distance between the source and observer is minimum)

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q91 JEE Main 2020 · 5 Sep · Shift 1 MCQ

In a resonance tube experiment when the tube is filled with water up to a height of 17. 0 cm , from bottom, it resonates with a given tuning fork. When the water level is raised the next resonance with the same tuning fork occurs at a height of 24. 5 cm . If the velocity of sound in air is 330 m s^{-1}, the tuning fork frequency is :

(A) 2200 Hz
(B) 550 Hz
(C) 1100 Hz
(D) 3300 Hz

Answer: (A) 2200 Hz · Key from source paper

Q92 JEE Main 2020 · 5 Sep · Shift 2 MCQ

A driver in a car, approaching a vertical wall notices that the frequency of his car horn has changed from 440 Hz to 480 Hz, when it gets reflected from the wall. If the speed of sound in air is 345 m s^{-1}, then the speed of the car is:

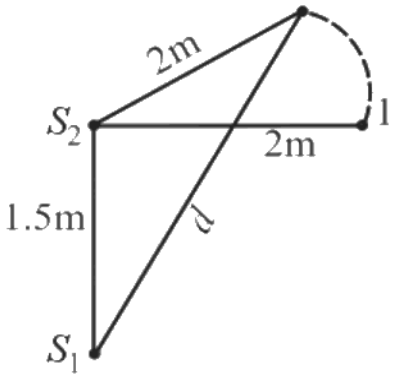
(A) 54 km/hr
(B) 36 km/hr
(C) 18 km/hr
(D) 24 km/hr

Answer: (A) 54 km/hr · Key from source paper

Q93 JEE Main 2020 · 5 Sep · Shift 2 MCQ

Two coherent sources of sound, S_1 and S_2, produce sound waves of the same wavelength $\lambda = 1$ m are in phase. S_1 and S_2 are placed 1. 5 m apart (see fig). A listener, located at L, directly in front of S_2, finds that the intensity is at a minimum when he is 2 m away from S_2. The listener moves away from S_1, keeping the distance from S_2 fixed. The adjacent maximum of intensity is observed when the listener is at a distance d from S_1. Then d is :
(see the figure above)

Q18. Two coherent sources of sound, S_1 and S_2, produce sound waves of the same wavelength $\lambda = 1$ m are in phase. S_1 and S_2 are placed 1. 5 m apart (see fig). A listener, located at L, directly in front of S_2, finds that the intensity is at a minimum when he is 2 m away from S_2. The listener moves away from S_1, keeping the distance from S_2 fixed. The adjacent maximum of intensity is observed when the listener is at a distance d from S_1. Then d is :



(1) 12m (2) 5m
(3) 2m (4) 3m

(A) 12m
(B) 5m
(C) 2m
(D) 3m

Answer: (D) 3m · Checked by our team

Q94 JEE Main 2020 · 4 Sep · Shift 1 MCQ

For a transvers wave travelling, along a straight line, the distance between two peaks (crests) is 5 m, while the distance between one crest and one trough is 1.5 m. The possible wavelengths (in m) of the waves are:

(A) 1, 3, 5
(B) $\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \ldots$
(C) 1, 2, 3, ...
(D) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \ldots$

Answer: (B) $\frac{1}{1}, \frac{1}{3}, \frac{1}{5}, \ldots$ · Key from source paper

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Q95 JEE Main 2020 · 4 Sep · Shift 2 MCQ

The driver of bus approaching a big wall notices that the frequency of his bus's horn changes from $420\ \mathrm{Hz}$ to $490\ \mathrm{Hz}$ when he hears it after it gets reflected from the wall. Find the speed of the bus if speed of the sound is $330\ \mathrm{ms}^{-1}$:

(A) $91\ \mathrm{kmh}^{-1}$
(B) $81\ \mathrm{kmh}^{-1}$
(C) $61\ \mathrm{kmh}^{-1}$
(D) $71\ \mathrm{kmh}^{-1}$

Answer: (A) $91\ \mathrm{kmh}^{-1}$ · Key from source paper

Q96 JEE Main 2020 · 3 Sep · Shift 1 MCQ

A uniform thin rope of length $12\ \mathrm{m}$ and mass $6\ \mathrm{kg}$ hangs vertically from a rigid support and a block of mass $2\ \mathrm{kg}$ is attached to its free end. A transverse short wave train of wavelength $6\ \mathrm{cm}$ is produced at the lower end of the rope. What is the wavelength of the wave train (in cm) when it reaches the top of the rope?

(A) 3
(B) 6
(C) 12
(D) 9

Answer: (C) 12 · Key from source paper

Q97 JEE Main 2020 · 2 Sep · Shift 1 MCQ

Two identical strings X and Z made of same material have tension $\mathrm{T_X}$ and $\mathrm{T_Z}$ in then if their fundamental frequencies are $450\ \mathrm{Hz}$ and $300\ \mathrm{Hz}$, respectively, then the ratio $\mathrm{T_X}/\mathrm{T_Z}$ is :

(A) 2.25
(B) 0.44
(C) 1.25
(D) 1.5

Answer: (A) 2.25 · Key from source paper

Q98 JEE Main 2020 · 2 Sep · Shift 2 Numerical

A wire of density $9 \times 10^{-3}\ \mathrm{kg\ cm^{-3}}$ is stretched between two clamps $1\ \mathrm{m}$ apart. The resulting strain in the wire is 4.9×10^{-4}. The lowest frequency of the transverse vibrations in the wire (Young's modulus of wire $Y = 9 \times 10^{10}\ \mathrm{Nm^{-2}}$), (to the nearest integer),_____

Numerical value type: the answer is a number.

Answer: 35. · Key from source paper

Q99 JEE Main 2020 · 9 Jan · Shift 1 MCQ

Three harmonic waves having equal frequency v and same intensity I_0 , have phase angles 0, $\frac{\pi}{4}$ and $-\frac{\pi}{4}$ respectively. When they are superimposed the intensity of the resultant wave is close to:

(A) $5.8I_0$

(B) $0.2I_0$

(C) $3I_0$

(D) I_0

Answer: (A) $5.8I_0$ · Key from source paper

Q100 JEE Main 2020 · 9 Jan · Shift 2 MCQ

A wire of length L and mass per unit length $6.0 \times 10^{-3}\ \mathrm{kg\,m^{-1}}$ is put under tension of $540\ \mathrm{N}$. Two consecutive frequencies that it resonates at are: $420\ \mathrm{Hz}$ and $490\ \mathrm{Hz}$. Then L in meters is :

(A) $2.1\mathrm{m}$

(B) $1.1\mathrm{m}$

(C) $8.1\mathrm{m}$

(D) $5.1\mathrm{m}$

Answer: (A) $2.1\mathrm{m}$ · Key from source paper

Q101 JEE Main 2020 · 8 Jan · Shift 1 Numerical

A one metre long (both ends open) organ pipe is kept in a gas that has double the density of air at STP. Assuming the speed of sound in air at STP is $300\ \mathrm{m/s}$, the frequency difference between the fundamental and second harmonic of this pipe is _____ Hz.

Numerical value type: the answer is a number.

Answer: 106. · Key from source paper

Q102 JEE Main 2020 · 8 Jan · Shift 2 MCQ

A transverse wave travels on a taut steel wire with a velocity of v when tension in it is $2.06 \times 10^4\mathrm{N}$. When the tension is changed to T, the velocity changed to $\frac{v}{2}$. The value of T is close to:

(A) $2.50 \times 10^4 \mathrm{N}$
(B) $5.15 \times 10^3\ \mathrm{N}$
(C) $30.5 \times 10^4\ \mathrm{N}$
(D) $10.2 \times 10^2\ \mathrm{N}$

Answer: (B) $5.15 \times 10^3\ \mathrm{N}$ · Key from source paper

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Q103 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Speed of a transverse wave on a straight wire (mass $6.0\ \mathrm{g}$, length $60\ \mathrm{cm}$ and area of cross-section $1.0\ \mathrm{mm}^2$ is $90\ \mathrm{m\,s}^{-1}$. If the Young's modulus of wire is $16 \times 10^{11}\ \mathrm{N\,m}^{-2}$, the extension of wire over its natural length is:

(A) $0.03\ \mathrm{mm}$
(B) $0.02\ \mathrm{mm}$
(C) $0.04\ \mathrm{mm}$
(D) $0.01\ \mathrm{mm}$

Answer: (A) $0.03\ \mathrm{mm}$ · Key from source paper

Q104 JEE Main 2020 · 7 Jan · Shift 2 MCQ

A stationary observer receives sound from two identical tuning forks, one of which approaches and the other one recedes with the same speed (much less than the speed of sound). The observer hears 2 beats/sec. The oscillation frequency of each tuning fork is $v_0 = 1400\ \mathrm{Hz}$ and the velocity of sound in air is $350\ \mathrm{m/s}$. The speed of each tuning fork is close to:

(A) $\frac{1}{2}\mathrm{m/s}$
(B) $1\mathrm{m/s}$
(C) $\frac{1}{4}\mathrm{m/s}$
(D) $\frac{1}{8}\mathrm{m/s}$

Answer: (C) $\frac{1}{4}\mathrm{m/s}$ · Key from source paper

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Q105 JEE Main 2019 · 12 Apr · Shift 1 MCQ

A submarine A travelling at $18\mathrm{km\ hr}^{-1}$ is being chased along the line of its velocity by another submarine B travelling at $27\ \mathrm{km\ hr}^{-1}$. B sends a sonar signal of 500 Hz to detect A and receives a reflected sound of frequency v. The value of v is closed to (Speed of sound in water $1500\ \mathrm{m\ s}^{-1}$)

(A) 504 Hz
(B) 499 Hz
(C) 502 Hz
(D) 507 Hz

Answer: (C) 502 Hz · Key from source paper

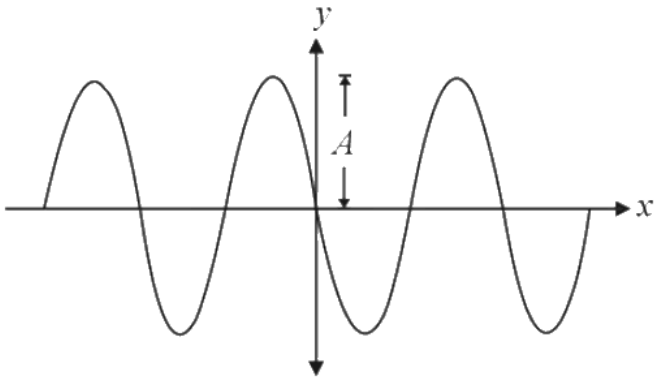
Q106 JEE Main 2019 · 12 Apr · Shift 1 MCQ

A progressive wave travelling along the positive $x-$ direction is represented by $yx, t = A\ \sin(kx - \omega t + \phi)$. Its snapshot at t $= 0$ is given in the figure.

(see the figure above)

For this wave, the phase ϕ is:

Q13. A progressive wave travelling along the positive x - direction is represented by $yx, \mathrm{t} = \mathrm{A}\sin\left(\mathrm{k}x - \omega\mathrm{t} + \phi\right)$. Its snapshot at t $= 0$ is given in the figure.



For this wave, the phase ϕ is:

(1) $\frac{\pi}{2}$ (2) 0

(3) π (4) $-\frac{\pi}{2}$

(A) $\frac{\pi}{2}$

(B) 0

(C) π

(D) $-\frac{\pi}{2}$

Answer: (C) π · Key from source paper

Q107 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A small speaker delivers 2 W of audio output. At what distance from the speaker will one detect 120 dB intensity sound? [Given reference intensity of sound as $10^{-12}\ \mathrm{W/m^2}$]

(A) 40 cm

(B) 20 cm

(C) 10 cm

(D) 30 cm

Answer: (A) 40 cm · Key from source paper

Q108 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Two sources of sound S_1 and S_2 produce sound waves of same frequency 660 Hz. A listener is moving from source S_1 towards S_2 with a constant speed $\mathrm{u_0\ m/s}$ and he hears 10 beats/s. The velocity of sound is 330 m/s. Then, $\mathrm{u_0}$ equals:

(A) 10.0 m/s
(B) 2.5 m/s
(C) 5.5 m/s
(D) 15.0 m/s

Answer: (B) 2.5 m/s · Key from source paper

Q109 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A tunning fork of frequency 480 Hz is used in an experiment for measuring speed of sound (v) in air by resonance tube method. Resonance is observed to occur at two successive lengths of the air column, $l_1 = 30\ \text{cm}$ and $l_2 = 70\ \text{cm}$. Then, v is equal to:

(A) $384\ \text{m s}^{-1}$
(B) $332\ \text{m s}^{-1}$
(C) $338\ \text{m s}^{-1}$
(D) $379\ \text{m s}^{-1}$

Answer: (A) $384\ \text{m s}^{-1}$ · Key from source paper

Q110 JEE Main 2019 · 10 Apr · Shift 1 MCQ

A stationary source emits sound waves of frequency $500\ \text{Hz}$. Two observers moving along a line passing through the source detect sound to be of frequencies $480\ \text{Hz}$ and $530\ \text{Hz}$. Their respective speeds are, in m s^{-1},
(Given speed of sound $= 300\ \text{m/s}$)

(A) $16,\ 14$
(B) $12,\ 16$
(C) $12,\ 18$
(D) $8,\ 18$

Answer: (C) $12,\ 18$ · Key from source paper

Q111 JEE Main 2019 · 10 Apr · Shift 2 MCQ

A source of sound S is moving with a velocity of $50\ \text{m s}^{-1}$ towards a stationary observer. The observer measures the frequency of the source as $1000\ \text{Hz}$. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? (Take velocity of sound in air is $350\ \text{m s}^{-1}$)

(A) $750\ \text{Hz}$
(B) $857\ \text{Hz}$
(C) $1143\ \text{Hz}$
(D) $807\ \text{Hz}$

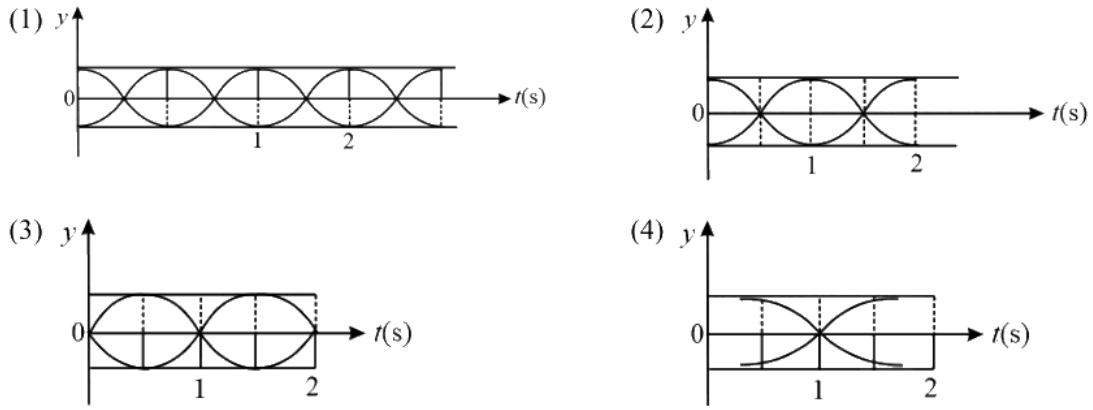
Answer: (A) $750\ \text{Hz}$ · Key from source paper

Q112 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The correct figure that shows, schematically, the wave pattern produced by the superposition of two waves of frequencies 9 Hz and 11 Hz, is

(see the figure above)

Q17. The correct figure that shows, schematically, the wave pattern produced by the superposition of two waves of frequencies 9 Hz and 11 Hz, is



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q113 JEE Main 2019 · 9 Apr · Shift 1 MCQ

A string is clamped at both the ends and it is vibrating in its 4th harmonic. The equation of the stationary wave is $y = 0.3\sin(0.157x)\cos(200\pi t)$. The length of the string is (All quantities are in SI units.)

(A) 20 m

(B) 60 m

(C) 40 m

(D) 80 m

Answer: (D) 80 m · Key from source paper

Q114 JEE Main 2019 · 9 Apr · Shift 1 MCQ

The pressure wave, $\mathrm{P} = 0.01\sin[1000t - 3x]\mathrm{N\ m^{-2}}$, corresponds to the sound produced by a vibrating blade on a day when atmospheric temperature is 0°C. On some other day when temperature is T , the speed of sound produced by the same blade and at the same frequency is found to be 336 $\mathrm{m\ s^{-1}}$. Approximate value of T is:

(A) 12° C
(B) 15° C
(C) 4° C
(D) 11° C

Answer: (C) 4° C · Key from source paper

Q115 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Two cars A and B are moving away from each other in opposite directions. Both the cars are moving with speed of 20 $\mathrm{m\ s^{-1}}$ with respect to the ground. If an observer in car A detects a frequency 2000 Hz of the sound coming from car B, what is the natural frequency of the sound source in car B? (speed of sound in air = 340 $\mathrm{m\ s^{-1}}$)

(A) 2150 Hz
(B) 2300 Hz
(C) 2250 Hz
(D) 2060 Hz

Answer: (C) 2250 Hz · Key from source paper

Q116 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A string 2.0 m long and fixed at its ends is driven by a 240 Hz vibrator. The string vibrates in its third harmonic mode. The speed of the wave and its fundamental frequency is

(A) 320 $\mathrm{m\ s^{-1}}$, 120 Hz
(B) 320 $\mathrm{m\ s^{-1}}$, 80 Hz
(C) 180 $\mathrm{m\ s^{-1}}$, 80 Hz
(D) 180 $\mathrm{m\ s^{-1}}$, 120 Hz

Answer: (B) 320 $\mathrm{m\ s^{-1}}$, 80 Hz · Key from source paper

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Q117 JEE Main 2019 · 8 Apr · Shift 1 MCQ

A wire of length 2L, is made by joining two wires A and B of same length but different radii r and 2r and made of the same material. It is vibrating at a frequency such that the joint of the two wires forms a node. If the number of antinodes in wire A is p and that in B is q then ratio p: q is:
(see the figure above)

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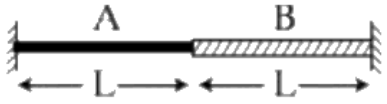
Q13. A wire of length 2L, is made by joining two wires A and B of same length but different radii r and 2r and made of the same material. It is vibrating at a frequency such that the joint of the two wires forms a node. If the number of antinodes in wire A is p and that in B is q then ratio p: q is:



(1) 3 : 5 (2) 4 : 9 (3) 1 : 4 (4) 1 : 2

(A) 3:5
(B) 4:9
(C) 1:4
(D) 1:2

Answer: (D) 1:2 · Key from source paper

Q118 JEE Main 2019 · 12 Jan · Shift 1 MCQ

A travelling harmonic wave is represented by the equation $y(x, t) = 10^{-3} \sin(50t + 2x)$, where x and y are in meter and t is in seconds. Which of the following is a correct statement about the wave?

(A) The wave is propagating along the positive x - axis with speed 25 m s^{-1}
(B) The wave is propagating along the positive x - axis with speed 100 m s^{-1}
(C) The wave is propagating along the negative x - axis with speed 25 m s^{-1}
(D) The wave is propagating along the negative x - axis with speed 100 m s^{-1}

Answer: (C) The wave is propagating along the negative x - axis with speed 25 m s^{-1} · Key from source paper

Q119 JEE Main 2019 · 12 Jan · Shift 2 MCQ

A resonance tube is old and has a jagged end. It is still used in the laboratory to determine the velocity of sound in air. A tuning fork of frequency 512 Hz produces first resonance when the tube is filled with water to a mark 11 cm below a reference mark, near the open end of the tube. The experiment is repeated with another fork of frequency 256 Hz which produces first resonance when water reaches a mark 27 cm below the reference mark. The velocity of sound in air, obtained in the experiment, is close to

(A) 335 m s^{-1}
(B) 341 m s^{-1}
(C) 322 m s^{-1}
(D) 328 m s^{-1}

Answer: (D) 328 m s^{-1} · Key from source paper

Q120 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Equation of travelling wave on a stretched string of linear density 5 g/m is y = 0.03 sin(450t − 9x) where distance and time are measured in SI units. The tension in the string is:

(A) 10 N
(B) 7.5 N
(C) 12.5 N
(D) 5 N

Answer: (C) 12.5 N · Key from source paper

Q121 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A train moves towards a stationary observer with speed $34\ m/s$. The train sounds a whistle and its frequency registered by the observer is f_1. If the speed of the train is reduced to $17\ m/s$, the frequency registered is f_2. If speed of sound is $340\ m/s$, then the ratio f_1/f_2 is:

(A) $21/20$
(B) $20/19$
(C) $19/18$
(D) $18/17$

Answer: (C) $19/18$ · Key from source paper

Q122 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A string of length 1 m and mass 5 g is fixed at both ends. The tension in the string is 8.0 N. The string is set into vibration using an external vibrator of frequency 100 Hz. The separation between successive nodes on the string is close to

(A) 20.0 cm
(B) 10.0 cm
(C) 16.6 cm
(D) 33.3 cm

Answer: (A) 20.0 cm · Key from source paper

Q123 JEE Main 2019 · 10 Jan · Shift 2 MCQ

A closed organ pipe has a fundamental frequency of $1.5\ \mathrm{kHz}$. The number of overtones that can be distinctly heard by a person with this organ pipe will be (Assume that the highest frequency a person can hear is $20{,}000\ \mathrm{Hz}$).

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(A) 7
(B) 4
(C) 6
(D) 5

Answer: (C) 6 · Key from source paper

Q124 JEE Main 2019 · 9 Jan · Shift 1 MCQ

A heavy ball of mass M is suspended from the ceiling of a car by a light string of mass m $m \ll M$. When the car is at rest, the speed of transverse waves in the string is $60\ \mathrm{ms}^{-1}$. When the car has acceleration a, the wave-speed increases to $60.5\ \mathrm{ms}^{-1}$. The value of a, in terms of gravitational acceleration g, is closed to

(A) $\frac{g}{10}$
(B) $\frac{g}{20}$
(C) $\frac{g}{5}$
(D) $\frac{g}{30}$

Answer: (C) $\frac{g}{5}$ · Key from source paper

Q125 JEE Main 2019 · 9 Jan · Shift 2 MCQ

A musician using an open flute of length $50\ \mathrm{cm}$ produces second harmonic sound waves. A person runs towards the musician from another end of a hall at a speed of $10\ \mathrm{km\ h}^{-1}$. If the wave speed is $330\ \mathrm{m\ s}^{-1}$, the frequency heard by the running person shall be close to

(A) $333\ \mathrm{Hz}$
(B) $500\ \mathrm{Hz}$
(C) $666\ \mathrm{Hz}$
(D) $753\ \mathrm{Hz}$

Answer: (C) $666\ \mathrm{Hz}$ · Key from source paper

Q126 JEE Main 2018 · 16 Apr · Online MCQ

The end correction of a resonance column is 1 cm. If the shortest length resonating with the tuning fork is 10 cm, the next resonating length should be

(A) 32 cm
(B) 40 cm
(C) 28 cm
(D) 36 cm

Answer: (A) 32 cm · Key from source paper

EdLoop JEE

Q127 JEE Main 2018 · 16 Apr · Online MCQ

Two sitar strings, A and B playing the note 'Dha' are slightly out of tune and produce beats of frequency 5 Hz. The tension of the string B is slightly increased and the beat frequency is found to decrease by 3 Hz. If the frequency of A is 425 Hz. The original frequency of B is

(A) 428 Hz
(B) 430 Hz
(C) 422 Hz
(D) 420 Hz

Answer: (D) 420 Hz · Key from source paper

Q128 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A tuning fork vibrates with frequency $256\ \mathrm{Hz}$ and gives one best (sic) per second with the third normal mode of vibration of an open pipe. What is the length of the pipe? (Speed of sound in air is $340\ \mathrm{ms}^{-1}$)

(A) (a) $190\ \mathrm{cm}$
(B) $180\ \mathrm{cm}$
(C) $220\ \mathrm{cm}$
(D) $200\ \mathrm{cm}$

Answer: (D) $200\ \mathrm{cm}$ · Key from source paper

Q129 JEE Main 2018 · 15 Apr · Shift 2 MCQ

5 beats/ second are heard when a turning fork is sounded with a sonometer wire under tension, when the length of the sonometer wire is either $0.95\ \mathrm{m}$ or $1\ \mathrm{m}$. The frequency of the fork will be:

(A) $195\ \mathrm{Hz}$
(B) $251\ \mathrm{Hz}$
(C) $150\ \mathrm{Hz}$
(D) $300\ \mathrm{Hz}$

Answer: (A) $195\ \mathrm{Hz}$ · Key from source paper

Q130 JEE Main 2018 · 8 Apr · Offline MCQ

A granite rod of $60\ \mathrm{cm}$ length is clamped at its middle point and is set into longitudinal vibrations. The density of granite is $2.7 \times 10^3\ \mathrm{kg\ m^{-3}}$ and its Young's modulus is $9.27 \times 10^{10}\ \mathrm{Pa}$. What will be the fundamental frequency of the longitudinal vibrations?

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(A) $7.5\ \text{kHz}$
(B) $5\ \text{kHz}$
(C) $2.5\ \text{kHz}$
(D) $10\ \text{kHz}$

Answer: (B) $5\ \text{kHz}$ · Key from source paper

Q131 JEE Main 2017 · 9 Apr · Online MCQ

A standing wave is formed by the superposition of two waves travelling in opposite directions. The transverse displacement is given by, $y(x,\ t) = 0.5 \sin\left(\frac{5\pi}{4}x\right)\cos(200\pi t)$. What is the speed of the travelling wave moving in the positive x direction? (x and t are in meter and second, respectively)

(A) $120\ \text{m s}^{-1}$
(B) $90\ \text{m s}^{-1}$
(C) $160\ \text{m s}^{-1}$
(D) $180\ \text{m s}^{-1}$

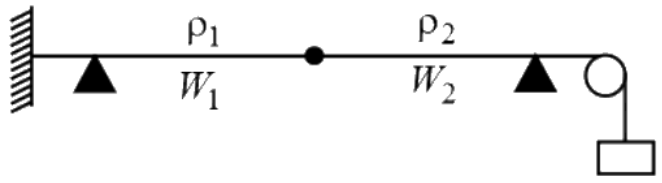
Answer: (C) $160\ \text{m s}^{-1}$ · Key from source paper

Q132 JEE Main 2017 · 8 Apr · Online MCQ

Two wires W_1 and W_2 have the same radius r and respective, densities ρ_1 and ρ_2, such that $\rho_2 = 4\rho_1$. They are joined together at the point O, as shown in the figure. The combination is used as a sonometer wire and kept under tension T. The point O is midway between the two bridges. When a stationary wave is set up in the composite wire, the joint is found to be a node. The ratio of the number of antinodes formed in W_1 to W_2 is

(see the figure above)

Q14. Two wires W_1 and W_2 have the same radius r and respective, densities ρ_1 and ρ_2, such that $\rho_2 = 4\rho_1$. They are joined together at the point O, as shown in the figure. The combination is used as a sonometer wire and kept under tension T. The point O is midway between the two bridges. When a stationary wave is set up in the composite wire, the joint is found to be a node. The ratio of the number of antinodes formed in W_1 to W_2 is



(1) 4 : 1
(2) 1 : 2
(3) 1 : 1
(4) 1 : 3

(A) $4 : 1$
(B) $1 : 2$
(C) $1 : 1$
(D) $1 : 3$

Answer: (B) $1 : 2$ · Key from source paper

Q133 JEE Main 2017 · 2 Apr · Offline MCQ

An observer is moving with half the speed of light towards a stationary microwave source emitting waves at frequency $10\ \mathrm{GHz}$. What is the frequency of the microwave measured by the observer? (speed of light $= 3 \times 10^8\ \mathrm{m\ s^{-1}}$)

(A) $15.3\ \mathrm{GHz}$
(B) $10.1\ \mathrm{GHz}$
(C) $12.1\ \mathrm{GHz}$
(D) $17.3\ \mathrm{GHz}$

Answer: (D) $17.3\ \mathrm{GHz}$ · Key from source paper

Q134 JEE Main 2016 · 10 Apr · Online MCQ

A toy-car, blowing its horn, is moving with a steady speed of $5\ \mathrm{m\,s^{-1}}$, away from a wall. An observer, towards whom the toy car is moving, is able to hear 5 beats per second. If the velocity in air is $340\ \mathrm{m\,s^{-1}}$ the frequency of the horn of the toy car is close to

(A) $680\ \mathrm{Hz}$
(B) $510\ \mathrm{Hz}$
(C) $340\ \mathrm{Hz}$
(D) $170\ \mathrm{Hz}$

Answer: (D) $170\ \mathrm{Hz}$ · Key from source paper

Q135 JEE Main 2016 · 9 Apr · Online MCQ

Two engines pass each other moving in opposite directions with uniform speed of 30 m/s. one of them is blowing a whistle of frequency 540 Hz. Calculate the frequency heard by driver of second engine before they pass each other. speed of sound is 330 m/sec:

(A) 450 Hz
(B) 540 Hz
(C) 270 Hz
(D) 648 Hz

Answer: (D) 648 Hz · Key from source paper

Q136 JEE Main 2016 · 3 Apr · Offline MCQ

A pipe open at both ends has a fundamental frequency f in air. The pipe is dipped vertically in water so that half of it is in water. The fundamental frequency of the air column is now:

(A) $2f$
(B) f
(C) $\frac{f}{2}$
(D) $\frac{3f}{4}$

Answer: (B) f · Key from source paper

Q137 JEE Main 2016 · 3 Apr · Offline MCQ

A uniform string of length 20 m is suspended from a rigid support. A short wave pulse is introduced at its lowest end. It starts moving up the string. The time taken to reach the support is
(Take, g = 10 m s^{-2})

(A) $2\sqrt{2}$ s
(B) $\sqrt{2}$ s
(C) $2\pi\sqrt{2}$ s
(D) 2 s

Answer: (A) $2\sqrt{2}$ s · Key from source paper

Q138 JEE Main 2015 · 11 Apr · Online MCQ

A source of sound emits sound waves at frequency f_0. It is moving towards an observer with fixed speed v_s ($v_s < v$, where v is the speed of sound in air). If the observer were to move towards the source with speed v_0, one of the following two graphs (A and B) will give the correct variation of the frequency f heard by the observer as v_0 is changed.
(see the figure above)
The variation of f with v_0 is given correctly by:

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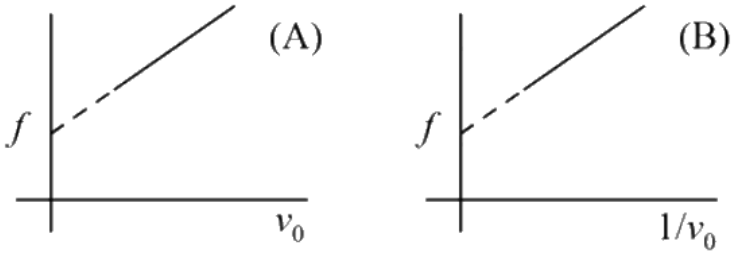
Q14. A source of sound emits sound waves at frequency f_0 . It is moving towards an observer with fixed speed v_s $(v_s < \mathrm{v})$, where v is the speed of sound in air). If the observer were to move towards the source with speed v_0 , one of the following two graphs (A and B) will give the correct variation of the frequency f heard by the observer as v_0 is changed.



The variation of f with v_0 is given correctly by:

(1) Graph A with slope $= \frac{f_0}{(v-v_s)}$

(2) Graph A with slope $= \frac{f_0}{(v+v_s)}$

(3) Graph B with slope $= \frac{f_0}{(v-v_s)}$

(4) Graph B with slope $= \frac{f_0}{(v+v_s)}$

(A) Graph A with slope $= \frac{f_0}{(v-v_s)}$

(B) Graph A with slope $= \frac{f_0}{(v+v_s)}$

(C) Graph B with slope $= \frac{f_0}{(v-v_s)}$

(D) Graph B with slope $= \frac{f_0}{(v+v_s)}$

Answer: (A) Graph A with slope $= \frac{f_0}{(v-v_s)}$ · Key from source paper

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Q139 JEE Main 2015 · 10 Apr · Online MCQ

A bat moving at $10\ \mathrm{m\,s^{-1}}$ towards a wall sends a sound signal of 8000 Hz towards it. On reflection, it hears a sound of frequency f. The value of f in Hz is close to (speed of sound $= 320\ \mathrm{m\,s^{-1}}$)

(A) 8258

(B) 8424

(C) 8000

(D) 8516

Answer: (D) 8516 · Key from source paper

Q140 JEE Main 2015 · 4 Apr · Offline MCQ

A train is moving on a straight track with speed $20\ \mathrm{m\,s^{-1}}$. It is blowing its whistle at the frequency of $1000\ \mathrm{Hz}$. The percentage change in the frequency heard by a person standing near the track as the train passes him is (speed of sound $= 320\ \mathrm{m\,s^{-1}}$) close to:

(A) 24%
(B) 6%
(C) 12%
(D) 18%

Answer: (C) 12% · Key from source paper

Q141 JEE Main 2014 · 19 Apr · Online MCQ

The total length of a sonometer wire fixed between two bridges is $110\ \mathrm{cm}$. Now, two more bridges are placed to divide the length of the wire in the ratio $6:3:2$. If the tension in the wire is $400\ \mathrm{N}$ and the mass per unit length of the wire is $0.01\ \mathrm{kg\ m^{-1}}$, then the minimum common frequency with which all the three parts can vibrate, is

(A) $1000\ \mathrm{Hz}$
(B) $1100\ \mathrm{Hz}$
(C) $100\ \mathrm{Hz}$
(D) $110\ \mathrm{Hz}$

Answer: (A) $1000\ \mathrm{Hz}$ · Key from source paper

Q142 JEE Main 2014 · 12 Apr · Online MCQ

A source of sound A emitting waves of frequency $1800\ \mathrm{Hz}$ is falling towards ground with a terminal speed v. The observer B on the ground directly beneath the source receives waves of frequency $2150\ \mathrm{Hz}$. The source A receives waves, reflected from ground of frequency nearly: (Speed of sound $= 343\ \mathrm{m/s}$)

(A) $2150\ \mathrm{Hz}$
(B) $2500\ \mathrm{Hz}$
(C) $1800\ \mathrm{Hz}$
(D) $2400\ \mathrm{Hz}$

Answer: (B) $2500\ \mathrm{Hz}$ · Key from source paper

Q143 JEE Main 2014 · 11 Apr · Online MCQ

Two factories are sounding their sirens at $800\ \mathrm{Hz}$. A man goes from one factory to other at a speed of $2\ \mathrm{m/s}$. The velocity of sound is $320\ \mathrm{m/s}$. The number of beats heard by the person in one second will be:

(A) 2
(B) 4
(C) 8
(D) 10

Answer: (D) 10 · Key from source paper

Q144 JEE Main 2014 · 9 Apr · Online MCQ

A transverse wave is represented by : $y = \frac{10}{\pi} \sin\left(\frac{2\pi}{T}t - \frac{2\pi}{\lambda}x\right)$ For what value of the wavelength the wave velocity is twice the maximum particle velocity?

(A) 40 cm
(B) 60 cm
(C) 10 cm
(D) 20 cm

Answer: (A) 40 cm · Key from source paper

Q145 JEE Main 2014 · 6 Apr · Offline MCQ

A pipe of length 85 cm is closed from one end. Find the number of possible natural oscillations of air column in the pipe whose frequencies lie below 1250 Hz. The velocity of sound in air is 340 m/s.

(A) 12
(B) 8
(C) 6
(D) 4

Answer: (C) 6 · Key from source paper

Q146 JEE Main 2013 · 25 Apr · Online MCQ

In a transverse wave the distance between a crest and neighbouring trough at the same instant is 4.0 cm and the distance between a crest and trough at the same place is 1.0 cm. The next crest appears at the same place after a time interval of 0.4 s. The maximum speed of the vibrating particles in the medium is:

(A) $\frac{3\pi}{2}$ cm/s
(B) $\frac{5\pi}{2}$ cm/s
(C) $\frac{\pi}{2}$ cm/s
(D) 2π cm/s

Answer: (B) $\frac{5\pi}{2}$ cm/s · Key from source paper

Q147 JEE Main 2013 · 23 Apr · Online MCQ

A sonometer wire of length 114 cm is fixed at both the ends. Where should the two bridges be placed so as to divide the wire into three segments whose fundamental frequencies are in the ratio $1 : 3 : 4$?

(A) At 36 cm and 84 cm from one end
(B) At 24 cm and 72 cm from one end
(C) At 48 cm and 96 cm from one end
(D) At 72 cm and 96 cm from one end

Answer: (D) At 72 cm and 96 cm from one end · Key from source paper

Q148 JEE Main 2013 · 22 Apr · Online MCQ

A and B are two sources generating sound waves. A listener is situated at C. The frequency of the source at A is $500\ \mathrm{Hz}$. A, now, moves towards C with a speed $4\ \mathrm{m/s}$. The number of beats heard at C is 6 . When A moves away from C with speed $4\ \mathrm{m/s}$, the number of beats heard at C is 18 . The speed of sound is $340\ \mathrm{m/s}$. The frequency of the source at B is :
(see the figure above)

Q13. A and B are two sources generating sound waves. A listener is situated at C. The frequency of the source at A is 500 Hz. A, now, moves towards C with a speed 4 m/s. The number of beats heard at C is 6 . When A moves away from C with speed 4 m/s, the number of beats heard at C is 18 . The speed of sound is 340 m/s. The frequency of the source at B is :



(1) 500 Hz (2) 506 Hz
(3) 512 Hz (4) 494 Hz

(A) $500\ \mathrm{Hz}$
(B) $506\ \mathrm{Hz}$
(C) $512\ \mathrm{Hz}$
(D) $494\ \mathrm{Hz}$

Answer: (C) $512\ \mathrm{Hz}$ · Key from source paper

Q149 JEE Main 2013 · 9 Apr · Online MCQ

When two sound waves travel in the same direction in a medium, the displacements of a particle located at ' x ' at time ' t ' is given by : $y_1 = 0.05\cos(0.50\pi x - 100\pi t)$, $y_2 = 0.05\cos(0.46\pi x - 92\pi t)$ where y_1, y_2 and x are in meters and t in seconds. The speed of sound in the medium is :

(A) 92 m/s
(B) 200 m/s
(C) 100 m/s
(D) 332 m/s

Answer: (B) 200 m/s · Key from source paper

Q150 JEE Main 2013 · 9 Apr · Online MCQ

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: (D) 30 m/s · Key from source paper

Q151 JEE Main 2013 · 7 Apr · Offline MCQ

A sonometer wire of length 1.5 m is made of steel. The tension in it produces an elastic strain of 1%. What is the fundamental frequency of steel if density and elasticity of steel are $7.7 \times 10^3\ \mathrm{kg\ m^{-3}}$ and $2.2 \times 10^{11}\ \mathrm{N\ m^{-2}}$ respectively?

(A) 200.5 Hz
(B) 770 Hz
(C) 188.5 Hz
(D) 178.2 Hz

Answer: (D) 178.2 Hz · Key from source paper

Q152 AIEEE 2012 · 26 May · Online MCQ

An air column in a pipe, which is closed at one end, will be in resonance wtih (sic) a vibrating tuning fork of frequency 264 Hz if the length of the column in cm is (velocity of sound $= 330$ m/s)

(A) 125.00
(B) 93.75
(C) 62.50
(D) 187.50

Answer: (B) 93.75 · Key from source paper

Q153 AIEEE 2012 · 26 May · Online MCQ

The disturbance $y(x,t)$ of a wave propagating in the positive x-direction is given by $y = \frac{1}{1+x^2}$ at time $t = 0$ and by $y = \frac{1}{[1+(x-1^2)]}$ at $t = 2$ s, where x and y are in meters. The shape of the wave disturbance does not change during the propagation. The velocity of wave in m/s is

(A) 2.0
(B) 4.0
(C) 0.5
(D) 1.0

Answer: (C) 0.5 · Key from source paper

Q154 AIEEE 2012 · 19 May · Online MCQ

A uniform tube of length $60.5\ \mathrm{cm}$ is held vertically with its lower end dipped in water. A sound source of frequency $500\ \mathrm{Hz}$ sends sound waves into the tube. When the length of tube above water is $16\ \mathrm{cm}$ and again when it is $50\ \mathrm{cm}$, the tube resonates with the source of sound. Two lowest frequencies (in Hz), to which tube will resonate when it is taken out of water, are (approximately).

(A) $281, 562$
(B) $281, 843$
(C) $276, 552$
(D) $272, 544$

Answer: (D) $272, 544$ · Key from source paper

Q155 AIEEE 2012 · 12 May · Online MCQ

This question has Statement 1 and Statement 2 . Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: Bats emitting ultrasonic waves can detect the location of a prey by hearing the waves reflected from it. Statement 2: When the source and the detector are moving, the frequency of reflected waves is changed.

(A) Statement 1 is false, Statement 2 is true.
(B) Statement 1 is true, Statement 2 is false.
(C) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1.
(D) Statement 1 is true, Statement 2 is true, Statement 2 is the correct explanation of Statement 1.

Answer: (C) Statement 1 is true, Statement 2 is true, Statement 2 is not the correct explanation of Statement 1. · Key from source paper

Q156 AIEEE 2012 · 12 May · Online MCQ

A wave represented by the equation $y_1 = a\cos(kx - \omega t)$ is superimposed with another wave to form a stationary wave such that the point $x = 0$ is node. The equation for the other wave is

(A) $a\cos(kx-\omega t+\pi)$
(B) $a\cos(kx+\omega t+\pi)$
(C) $a\cos\left(kx+\omega t+\frac{\pi}{2}\right)$
(D) $a\cos\left(kx-\omega t+\frac{\pi}{2}\right)$

Answer: (B) $a\cos(kx+\omega t+\pi)$ · Key from source paper

Q157 AIEEE 2012 · 7 May · Online MCQ

Following are expressions for four plane simple harmonic waves (i) $y_1=A\cos 2\pi\left(n_1t+\frac{x}{\lambda_1}\right)$ (ii) $y_2=A\cos 2\pi\left(n_1t+\frac{x}{\lambda_1}+\pi\right)$ (iii) $y_3=A\cos 2\pi\left(n_2t+\frac{x}{\lambda_2}\right)$ (iv) $y_4=A\cos 2\pi\left(n_2t-\frac{x}{\lambda_2}\right)$ The pairs of waves which will produce destructive interference and stationary waves respectively in a medium, are

(A) (iii, iv), (i, ii)
(B) (i, iii), (ii, iv)
(C) (i, iv), (ii, iii)
(D) (i, ii), (iii, iv)

Answer: (D) (i, ii), (iii, iv) · Key from source paper

Q158 AIEEE 2012 · 7 May · Online MCQ

This question has Statement 1 and Statement 2. Of the four choices given after the Statements, choose the one that best describes the two Statements. Statement 1: In the resonance tube experiment, if the tuning fork is replaced by another identical turning (sic) fork but with its arm having been filed, the length of the air column should be increased to obtain resonance again. Statement 2: On filing the arms, the frequency of a tuning fork increases.

(A) Statement 1 is true, Statement 2 is true, Statement 2 is a correct explanation of Statement 1.
(B) Statement 1 is true, Statement 2 is false.
(C) Statement 1 is false, Statement 2 is true.
(D) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation of Statement 1.

Answer: (C) Statement 1 is false, Statement 2 is true. · Key from source paper

Q159 AIEEE 2012 · Offline MCQ

A cylindrical 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 the air-column is now

(A) f
(B) $\frac{f}{2}$
(C) $\frac{3f}{4}$
(D) $2f$

Answer: (A) f · Key from source paper

Q160 AIEEE 2011 MCQ

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 $\sqrt{\frac{a}{b}}$

Answer: (A) wave moving in $-x$ direction with speed $\sqrt{\frac{b}{a}}$ · Key from source paper

Q161 AIEEE 2010 MCQ

The equation of a wave on a string of linear mass density 0.04 kg m^{-1} is given by $y = 0.02(\mathrm{\ m}) \sin\left[2\pi\left(\frac{t}{0.04(\mathrm{\ s})} - \frac{x}{0.50(\mathrm{\ m})}\right)\right]$. The tension in the string is

(A) 4.0 N
(B) 12.5 N
(C) 0.5 N
(D) 6.25 N

Answer: (D) 6.25 N · Key from source paper

Q162 AIEEE 2009 MCQ

A motor cycle starts from rest and accelerates along a straight path at $2\ \mathrm{m/s^2}$. At the starting point of the motor cycle there is a stationary electric sire. How far has the motor cycle gone when the driver hears the frequency of the siren at 94% of its value when the motor cycle was at rest? (speed of sound = $330\ \mathrm{ms}^{-1}$)

(A) 49 m
(B) 98 m
(C) 147 m
(D) 196 m

Answer: (B) 98 m · Key from source paper

Q163 AIEEE 2009 MCQ

Three sound waves of equal amplitudes have frequencies $(v-1)$, v, $(v+1)$. They superpose to give beats. The number of beats produced per second will be

(A) 4
(B) 3
(C) 2
(D) 1

Answer: (C) 2 · Key from source paper

Q164 AIEEE 2008 MCQ

While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at a column length of 18 cm during winter. Repeating the same experiment during summer, she measures the column length to be x cm for the second resonance. Then

(A) $18 > x$
(B) $x > 54$
(C) $54 > x > 36$
(D) $36 > x > 18$

Answer: (B) $x > 54$ · Key from source paper

Q165 AIEEE 2008 MCQ

The speed of sound in oxygen (O_2) at a certain temperature is $460\ \mathrm{ms}^{-1}$. The speed of sound in helium (He) at the same temperature will be (assumed both gases to be ideal)

(A) $460\ \mathrm{ms}^{-1}$
(B) $500\ \mathrm{ms}^{-1}$
(C) $650\ \mathrm{ms}^{-1}$
(D) None of these

Answer: (D) None of these · Key from source paper

Q166 AIEEE 2008 MCQ

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

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(A) $\alpha = 25.00\pi,\ \beta = \pi$
(B) $\alpha = \frac{0.08}{\pi},\ \frac{2.0}{\pi}$
(C) $\alpha = \frac{0.04}{\pi},\ \beta = \frac{1.0}{\pi}$
(D) $\alpha = 12.50\pi,\ \beta = \frac{\pi}{2.0}$

Answer: (A) $\alpha = 25.00\pi,\ \beta = \pi$ · Key from source paper

Q167 AIEEE 2007 MCQ

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

(A) 1000
(B) 10000
(C) 10
(D) 100

Answer: (D) 100 · Key from source paper

Q168 AIEEE 2006 MCQ

A whistle producing sound waves of frequencies 9500 Hz and above is approaching a stationary person with speed v ms^{-1}. The velocity of sound in air is 300 ms^{-1}. If the person can hear frequencies upto a maximum of 10, 000 Hz, the maximum value of v upto which he can hear the whistle is

(A) 30 ms^{-1}
(B) $15\sqrt{2}$ ms^{-1}
(C) $15/\sqrt{2}$ ms^{-1}
(D) 15 ms^{-1}

Answer: (D) 15 ms^{-1} · Key from source paper

Q169 AIEEE 2006 MCQ

A string is stretched between fixed points separated by 75 cm. It is observed to have resonant frequencies of 420 Hz and 315 Hz. There are no other resonant frequencies between these two. Then, the lowest resonant frequency for this string is

(A) 10.5 Hz
(B) 105 Hz
(C) 1.05 Hz
(D) 1050 Hz

Answer: (B) 105 Hz · Key from source paper

Q170 AIEEE 2005 MCQ

When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2 . When the tuning forks are sounded again, 6

beats per seconds are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2 ?

(A) 200 Hz
(B) 202 Hz
(C) 196 Hz
(D) 204 Hz

Answer: (C) 196 Hz · Key from source paper

Q171 AIEEE 2005 MCQ

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) zero
(B) 0.5%
(C) 5%
(D) 20%

Answer: (D) 20% · Key from source paper

Q172 AIEEE 2004 MCQ

The displacement y of a particle in a medium can be expressed as $y = 10^{-6}\sin(100t + 20x + \pi/4)m$, where t is in seconds and x in meter. The speed of the wave is

(A) 2000 m/s
(B) 5 m/s
(C) 20 m/s
(D) 5πm/s

Answer: (B) 5 m/s · Key from source paper

Q173 AIEEE 2003 MCQ

The displacement y of a wave travelling in the x-direction is given by $y = 10^{-4}\sin\left(600t - 2x + \frac{\pi}{3}\right)$ metres where x is expressed in metres and t in seconds. The speed of the wave-motion, in ms^{-1}, is

(A) 300
(B) 600
(C) 1200
(D) 200

Answer: (A) 300 · Checked by our team

Q174 AIEEE 2003 MCQ

A tuning fork of known frequency 256 Hz makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

(A) 256 + 2 Hz
(B) 256 − 2 Hz
(C) 256 − 5 Hz
(D) 256 + 5 Hz

Answer: (C) 256 − 5 Hz · Checked by our team

Q175 AIEEE 2003 MCQ

A metal wire of linear mass density of 9.8 g/m is stretched with a tension of 10 kg-wt between two rigid supports 1 metre apart. The wire passes at its middle point between the poles of a permanent magnet, and it vibrates in resonance when carrying an alternating current of frequency n. The frequency n of the alternating source is

(A) 50 Hz
(B) 100 Hz
(C) 200 Hz
(D) 25 Hz

Answer: (A) 50 Hz · Key from source paper

Q176 AIEEE 2002 MCQ

Length of a string tied to two rigid supports is 40 cm. Maximum length (wave length in cm) of a stationary wave produced on it is

(A) 20
(B) 80
(C) 40
(D) 120

Answer: (B) 80 · Key from source paper

Q177 AIEEE 2002 MCQ

Tube A has both ends open while tube B has one end closed, otherwise they are identical. The ratio of fundamental frequency of tube A and B is

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(A) 1 : 2
(B) 1 : 4
(C) 2 : 1
(D) 4 : 1

Answer: (C) 2 : 1 · Key from source paper

Q178 AIEEE 2002 MCQ

A tuning fork arrangement (pair) produces 4 beats / sec with one fork of frequency 288cps. A little wax is placed on the unknown fork and it then produces 2 beats /sec. The frequency of the unknown fork is

(A) 286 cps
(B) 292 cps
(C) 294 cps
(D) 288 cps

Answer: (B) 292 cps · Key from source paper

Q179 AIEEE 2002 MCQ

A wave $y = a\sin(\omega t - kx)$ on a string meets with another wave producing a node at $x = 0$. Then the equation of the unknown wave is

(A) $y = a\sin(\omega t + kx)$
(B) $y = -a\sin(\omega t + kx)$
(C) $\mathrm{y = a\sin(\omega t - kx)}$
(D) $\mathrm{y = -a\sin(\omega t - kx)}$

Answer: (B) $y = -a\sin(\omega t + kx)$ · Key from source paper

Q180 AIEEE 2002 MCQ

When temperature increases, the frequency of a tuning fork

(A) increases
(B) decreases
(C) remains same
(D) increases or decreases depending on the material

Answer: (B) decreases · Key from source paper