

Q1. JEE Main 2026 (28 January Shift 2)

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.

(1) 398 (2) 401 (3) 399 (4) 402

Q2. JEE Main 2026 (28 January Shift 2)

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.

Q3. JEE Main 2026 (24 January Shift 2)

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

- (1) increase by 64 times (2) increase by 8 times
(3) decrease by 4 times (4) decrease by 8 times

Q4. JEE Main 2026 (24 January Shift 2)

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 _____.

- (1) 3 (2) 4 (3) 1 (4) 2

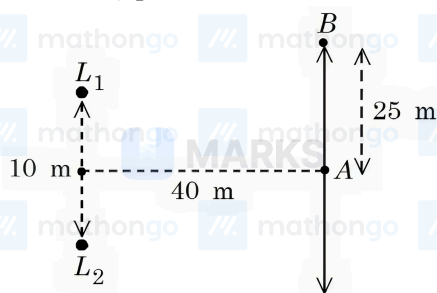
Q5. JEE Main 2026 (22 January Shift 2)

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.)

- (1) 275 (2) 250 (3) 225 (4) 200

Q6. JEE Main 2026 (22 January Shift 1)

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 $\sqrt{5} = 2.23$)



Q7. JEE Main 2026 (23 January Shift 2)

The velocity of sound in air is doubled when the temperature is raised from 0°C to $\alpha^\circ\text{C}$. The value of α is _____.

Q8. JEE Main 2026 (21 January Shift 1)

Two strings (A, B) having linear densities $\mu_A = 2 \times 10^{-4} \text{ kg/m}$ and, $\mu_B = 4 \times 10^{-4} \text{ kg/m}$ and lengths $L_A = 2.5 \text{ m}$ and $L_B = 1.5 \text{ m}$ 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 :

- (1) 1.90 (2) 1.67 (3) 1.08 (4) 1.18

ANSWERS AND SOLUTIONS

1. (2) 2. 384 3. (3) 4. (4) 5. (3) 6. 600 7. 819 8. (4)

1. (2) The speed of a longitudinal wave in a solid is given by $v = \sqrt{\frac{Y}{\rho}}$ where Y is Young's modulus and ρ is density.

$$\text{Initial condition: } v_0 = \sqrt{\frac{Y}{\rho}} = 400 \text{ m/s}$$

After changes: $\rho' = 1.005\rho$ (0.5% increase) and $Y' = 1.01Y$ (1% increase)

$$\text{New speed: } v' = \sqrt{\frac{Y'}{\rho'}} = \sqrt{\frac{1.01Y}{1.005\rho}} = \sqrt{\frac{1.01}{1.005}} \cdot \sqrt{\frac{Y}{\rho}}$$

$$\frac{v'}{v_0} = \sqrt{\frac{1.01}{1.005}} = \sqrt{1.00498...} \approx 1.00249$$

$$v' = 400 \times 1.00249 \approx 401 \text{ m/s}$$

2. (384) $|f_A - f_B| = 4$

$$|f_A - 380| = 4$$

So, $f_A = 384 \text{ Hz}$ or 376 Hz

on loading with wax f_A decreases

So, $f_A = 384 \text{ Hz}$

3. (3) For a point source, intensity is given by $I = \frac{P}{4\pi r^2}$ where P is power and r is distance.

If the volume of the spherical detector increases by 8 times, then $\frac{4}{3}\pi r_{\text{new}}^3 = 8 \cdot \frac{4}{3}\pi r_{\text{old}}^3$, giving $r_{\text{new}} = 2r_{\text{old}}$.

$$\text{The new intensity is } I_{\text{new}} = \frac{P}{4\pi(2r_{\text{old}})^2} = \frac{1}{4} \cdot \frac{P}{4\pi r_{\text{old}}^2} = \frac{I_{\text{old}}}{4}.$$

Therefore intensity decreases by 4 times.

4. (4) Fifth harmonic of closed organ pipe equals first harmonic of open pipe:

$$f_{5 \text{ closed}} = f_{1 \text{ open}}$$

$$\frac{5v}{4L_{\text{closed}}} = \frac{v}{2L_{\text{open}}}$$

$$\frac{L_{\text{closed}}}{L_{\text{open}}} = \frac{5}{2}$$

Since the ratio is $\frac{5}{x}$, we get $x = 2$.

5. (3) For an open organ pipe, the n -th harmonic frequency is $f_n = n \cdot \frac{v}{2L}$.

The 3rd harmonic is $v_3 = 3 \cdot \frac{330}{2L}$ and the 6th harmonic is $v_6 = 6 \cdot \frac{330}{2L}$.

Taking the difference: $v_6 - v_3 = (6 - 3) \cdot \frac{330}{2L} = 3 \cdot \frac{330}{2L} = 2200$.

$$\text{Solving for } L: L = \frac{3 \times 330}{2 \times 2200} = \frac{990}{4400} = 0.225 \text{ m} = 225 \text{ mm}.$$

6. (600) Point B will 10^{th} maxima

$$\Delta x = L_2 B - L_1 B$$

$$L_1 B = \sqrt{20^2 + 40^2} = 20\sqrt{5} \text{ m} = 44.6 \text{ m}$$

$$L_2 B = \sqrt{40^2 + 30^2} = 50 \text{ m}$$

$$\Delta x = 50 - 44.6 = 5.4 \text{ m}$$

$$\Delta x = n\lambda$$

$$5.4 = 10 \times \lambda$$

$$\lambda = 0.54 \text{ m}$$

$$V = f\lambda$$

$$f = \frac{324}{0.54} = 600 \text{ Hz}$$

7. (819) The velocity of sound in air depends on temperature as $v \propto \sqrt{T}$ (absolute temperature).

If the velocity doubles:

$$\frac{v_2}{v_1} = 2 = \sqrt{\frac{T_2}{T_1}}.$$

$$\text{Squaring: } \frac{T_2}{T_1} = 4.$$

With $T_1 = 0^\circ \text{C} = 273.15 \text{ K}$ and $T_2 = 273.15 + \alpha \text{ K}$:

$$\frac{273.15 + \alpha}{273.15} = 4, \text{ giving } 273.15 + \alpha = 1092.6 \text{ K.}$$

Therefore $\alpha = 819.45^\circ \text{C} \approx 819^\circ \text{C}$.

8. (4) Wave velocity in string: $v = \sqrt{\frac{T}{\mu}}$

Time to reach joint: $t = \frac{L}{v} = L\sqrt{\frac{\mu}{T}}$

$$t_1 = L_A \sqrt{\frac{\mu_A}{T}} \text{ and } t_2 = L_B \sqrt{\frac{\mu_B}{T}}$$

$$\frac{t_1}{t_2} = \frac{L_A}{L_B} \times \sqrt{\frac{\mu_A}{\mu_B}} = \frac{2.5}{1.5} \times \sqrt{\frac{2 \times 10^{-4}}{4 \times 10^{-4}}}$$

$$= \frac{5}{3} \times \sqrt{\frac{1}{2}} = \frac{5}{3\sqrt{2}} = \frac{5\sqrt{2}}{6} \approx 1.18$$