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JEE MAIN WAVES — PYQS

Max. Marks: 84 **Questions:** 21

Section A (MCQ) — 17 questions

Q.1 The equation of a plane progressive wave is given by $y = 5\cos\pi\left(200t - \frac{x}{150}\right)$ where x and y are in cm and t is in second. The velocity of the wave is _____ m/s.

[JEE Main 2026 (Online) 2nd April Morning Shift]

(1) 120 (2) 150 (3) 200 (4) 300

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Q.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.

[JEE Main 2026 (Online) 28th January Evening Shift]

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

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Q.3 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 _____

[JEE Main 2026 (Online) 24th January Evening Shift]

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

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Q.4 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.)

[JEE Main 2026 (Online) 22nd January Evening Shift]

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

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Q.5 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 :

[JEE Main 2025 (Online) 7th April Evening Shift]

(1) 10 cm (2) 2.5 cm (3) 20 cm (4) 5.0 cm

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Q.6 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:

[JEE Main 2026 (Online) 21st January Morning Shift]

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

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Q.7 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) [JEE Main 2025 (Online) 8th April Evening Shift]

(1) $\left[\sqrt{3}, \frac{\pi}{6}\right]$ (2) $\left[2\sqrt{3}, \frac{\pi}{6}\right]$

(3) $\left[6, \frac{2\pi}{3}\right]$ (4) $\left[6, \frac{\pi}{3}\right]$

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Q.8 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 $\frac{v_2}{v_1} =$

[JEE Main 2025 (Online) 8th April Evening Shift]

(1) 8 (2) 4 (3) 2 (4) $\sqrt{2}$

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Q.9 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) [JEE Main 2025 (Online) 7th April Morning Shift]

(1) 1 s (2) 4 s (3) 2 s (4) 6 s

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Q.10 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

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) $\sqrt{\frac{7}{5}} : \sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}}$ (2) $\sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}} : \sqrt{\frac{4}{3}}$

(3) $\sqrt{\frac{5}{3}} : \sqrt{\frac{4}{3}} : \sqrt{\frac{7}{5}}$ (4) $\sqrt{\frac{4}{3}} : \sqrt{\frac{5}{3}} : \sqrt{\frac{7}{5}}$

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Q.11 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

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) 20% (2) 25% (3) −20% (4) −25%

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Q.12 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 :
(π = 3.14)

[JEE Main 2025 (Online) 4th April Evening Shift]

(1) 0.33 m (2) 0.5 m (3) 3 m (4) 5 m

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Q.13 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:

[JEE Main 2025 (Online) 3rd April Evening Shift]

(1) 370 m/s (2) 340 m/s

(3) 335 m/s (4) 360 m/s

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Q.14 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?

[JEE Main 2025 (Online) 2nd April Evening Shift]

(1) $y = 2\cos(0.83x - 3.35t)$ cm

(2) $y = 2\sin(0.83x - 3.5t)$ cm

(3) $y = 2\cos(0.13x - 0.5t)$ cm

(4) $y = 2\cos(3.35x - 0.83t)$ cm

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Q.15 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

[JEE Main 2025 (Online) 28th January Morning Shift]

(1) Both A and R are true and R is the correct explanation of A

(2) A is false but R is true

(3) A is true but R is false

(4) Both A and R are true but R is NOT the correct explanation of A

Scan or tap for the full solution

Q.16 The equation of a transverse wave travelling along a string is
$y(x, t) = 4.0\sin[20 \times 10^{-3}x + 600t]$mm, where x is in mm and t is in second. The velocity of the wave is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) −60 m/s (2) +60 m/s

(3) +30 m/s (4) −30 m/s

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Q.17 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 :

[JEE Main 2025 (Online) 22nd January Morning Shift]

(1) $\frac{15}{7}$ cm (2) $\frac{20}{9}$ cm

(3) $\frac{20}{7}$ cm (4) $\frac{15}{9}$ cm

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Section B (Numerical) — 4 questions

Q.18 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)
(π = 3.14)

[JEE Main 2026 (Online) 5th April Morning Shift]

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Q.19 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.

[JEE Main 2026 (Online) 28th January Evening Shift]

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Q.20 The velocity of sound in air is doubled when the temperature is raised from 0°C to α°C. The value of α is _____.

[JEE Main 2026 (Online) 23rd January Evening Shift]

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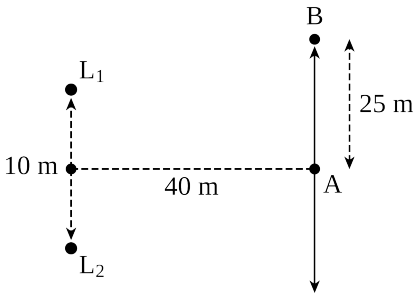
Q.21 Two loudspeakers (L_1 and L_2) are placed with a separation of 10 m, as shown in figure. Both speakers are fed with an audio input signal of same frequency with constant volume. A voice recorder, initially at point A, equidistant from both loudspeakers, is moved by 25 m along the line AB while monitoring 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 $\sqrt{5} = 2.23$)

[JEE Main 2026 (Online) 22nd January Morning Shift]



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ANSWER KEY

Section A (MCQ) — 17 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	**4**	**3**	**2**	**2**	**4**	**2**	**2**	**3**	**3**	**3**	**2**
Ques.	12	13	14	15	16	17					
Ans.	**3**	**4**	**1**	**3**	**4**	**2**					

Section B (Numerical) — 4 questions

Ques.	18	19	20	21			
Ans.	**349**	**384**	**819**	**600**			