

PHYSICS · JEE MAIN

Sound Waves

Chapter-wise previous year questions, with answer key

31

PYQS

2020–2025

PAPERS

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TOPICS

Doppler Effect

Speed of Sound

Beats

Intensity and Loudness

Resonance

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Doppler Effect · 15 PYQs

Q1 JEE Main 2023 · 11 Apr · Shift 2

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

(A) 485 Hz

(B) 514 Hz

(C) 421 Hz

(D) 471 Hz

[Step-by-step solution ► prepwisser.in/questions/jUFama2ogk](https://www.prepwisser.in/questions/jUFama2ogk)

Q2 JEE Main 2023 · 8 Apr · Shift 1

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

(A) 200 Hz

(B) 412 Hz

(C) 400 Hz

(D) 388 Hz

[Step-by-step solution ► prepwisser.in/questions/u7TO6KS-aP](https://www.prepwisser.in/questions/u7TO6KS-aP)

Q3 JEE Main 2023 · 6 Apr · Shift 1

A person driving car at a constant speed of 15m/s is approaching a vertical wall. The person notices a change of 40Hz in the frequency of his car's horn upon reflection from the wall. The frequency of horn is _____ Hz.

(Given: Speed of sound : 330m/s)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/jPfmux_M4-](https://www.prepwisser.in/questions/jPfmux_M4-)

Q4 JEE Main 2023 · 29 Jan · Shift 1

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

(A) 10 Hz

(B) 55 Hz

(C) 80 Hz

(D) 33 Hz

[Step-by-step solution ► prepwisser.in/questions/79T2G1uNwT](https://www.prepwisser.in/questions/79T2G1uNwT)

Q5 JEE Main 2023 · 25 Jan · Shift 2

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/CWtwmRuRgI](https://www.prepwisser.in/questions/CWtwmRuRgI)

Q6 JEE Main 2022 · 28 Jul · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/1FHCLXf6ju](https://www.prepwiser.in/questions/1FHCLXf6ju)

Q7 JEE Main 2022 · 26 Jul · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/mjoxXfBchj](https://www.prepwiser.in/questions/mjoxXfBchj)

Q8 JEE Main 2022 · 30 Jun · Shift 1

An employee of a factory moving away from his workplace by a car listens to the siren of the factory. He drives the car at the speed of 72 kmh^{-1} in the direction of wind which is blowing at 72 kmh^{-1} speed. Frequency of siren is 720 Hz. The employee hears an apparent frequency of _____ Hz.

(Assume speed of sound to be 340 ms^{-1})

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/7H5qlQp6rt](https://www.prepwiser.in/questions/7H5qlQp6rt)

Q9 JEE Main 2022 · 27 Jun · Shift 1

An observer moves towards a stationary source of sound with a velocity equal to one-fifth of the velocity of sound. The percentage change in the frequency will be :

- | | |
|---------|---------|
| (A) 20% | (B) 10% |
| (C) 5% | (D) 0% |

[Step-by-step solution ► prepwiser.in/questions/q0ZGl3eAxp](https://www.prepwiser.in/questions/q0ZGl3eAxp)

Q10 JEE Main 2022 · 26 Jun · Shift 2

For a specific wavelength 670 nm of light coming from a galaxy moving with velocity v , the observed wavelength is 670.7 nm. The value of v is :

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

[Step-by-step solution ► prepwiser.in/questions/Xcbgj7ffRH](https://www.prepwiser.in/questions/Xcbgj7ffRH)

Q11 JEE Main 2021 · 27 Aug · Shift 1

Two cars X and Y are approaching each other with velocities 36 km/h and 72 km/h 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 m/s, the actual frequency of the whistle sound produced is Hz.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/_DXWvQM5i2](https://www.prepwiser.in/questions/_DXWvQM5i2)

Q12 JEE Main 2021 · 26 Aug · Shift 1

A source and a detector move away from each other in absence of wind with a speed of 20 m/s with respect to the ground. If the detector detects a frequency of 1800 Hz of the sound coming from the source, then the original frequency of source considering speed of sound in air 340 m/s will be Hz.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/u05f1N8G1_](https://www.prepwiser.in/questions/u05f1N8G1_)

Q13 JEE Main 2021 · 20 Jul · Shift 2

With what speed should a galaxy move outward with respect to earth so that the sodium-D line at wavelength $5890 \text{ \AA}$ is observed at $5896 \text{ \AA}$?

- (A) 306 km/sec (B) 322 km/sec
(C) 296 km/sec (D) 336 km/sec

[Step-by-step solution ► prepwiser.in/questions/5BZVas5FiQ](https://www.prepwiser.in/questions/5BZVas5FiQ)

Q14 JEE Main 2021 · 20 Jul · Shift 1

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 m/s. Then the speed of car is _____ km/h.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/ectP7u3fCM](https://www.prepwiser.in/questions/ectP7u3fCM)

Q15 JEE Main 2020 · 4 Sep · Shift 2

The driver of a bus approaching a big wall notices that the frequency of his bus's horn changes from 420 Hz to 490 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 ms^{-1} .

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

[Step-by-step solution ► prepwiser.in/questions/66WRvIX2L2](https://www.prepwiser.in/questions/66WRvIX2L2)

Speed of Sound · 6 PYQs

Q16 JEE Main 2025 · 4 Apr · Shift 1

Consider the sound wave travelling in ideal gases of He, CH₄, and CO₂. 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 $V_{\text{He}} : V_{\text{CH}_4} : V_{\text{CO}_2}$ is given by

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

[Step-by-step solution ► prepwiser.in/questions/8l6U3d_6Xw](https://www.prepwiser.in/questions/8l6U3d_6Xw)

Q17 JEE Main 2025 · 28 Jan · Shift 1

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

Step-by-step solution ► [prepwisser.in/questions/cNBIETCc06](https://www.prepwisser.in/questions/cNBIETCc06)

Q18 JEE Main 2024 · 8 Apr · Shift 2

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

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

Step-by-step solution ► [prepwisser.in/questions/Gz5tFzoRcW](https://www.prepwisser.in/questions/Gz5tFzoRcW)

Q19 JEE Main 2024 · 31 Jan · Shift 2

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

- (A) 341 m/s
- (B) 333 m/s
- (C) 325 m/s
- (D) 315 m/s

Step-by-step solution ► [prepwisser.in/questions/7koxS_pqik](https://www.prepwisser.in/questions/7koxS_pqik)

Q20 JEE Main 2023 · 6 Apr · Shift 2

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

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

Step-by-step solution ► [prepwisser.in/questions/_FKUxNqjc9](https://www.prepwisser.in/questions/_FKUxNqjc9)

Q21 JEE Main 2021 · 17 Mar · Shift 2

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

- (A) $Y(x, t) = 0.03 [\sin 5.1x - (0.2 \times 10^3)t]$
- (B) $Y(x, t) = 0.03 [\sin 5.1x - (1.5 \times 10^3)t]$
- (C) $Y(x, t) = 0.06 [\sin 5.1x - (1.5 \times 10^3)t]$
- (D) $Y(x, t) = 0.06 [\sin 0.8x - (0.5 \times 10^3)t]$

Step-by-step solution ► [prepwisser.in/questions/5fENnXIZqv](https://www.prepwisser.in/questions/5fENnXIZqv)

Q22 JEE Main 2025 · 7 Apr · Shift 1

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) 4 s
(C) 2 s (D) 6 s

[Step-by-step solution ► prepwiser.in/questions/dAqimYvXtg](https://www.prepwiser.in/questions/dAqimYvXtg)

Q23 JEE Main 2024 · 1 Feb · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/IvIkTcLvSf](https://www.prepwiser.in/questions/IvIkTcLvSf)

Q24 JEE Main 2022 · 28 Jun · Shift 1

The velocity of sound in a gas, in which two wavelengths 4.08 m and 4.16 m produce 40 beats in 12s, will be :

- (A) 282.8 ms^{-1}
(B) 175.5 ms^{-1}
(C) 353.6 ms^{-1}
(D) 707.2 ms^{-1}

[Step-by-step solution ► prepwiser.in/questions/RgqSsoKmnv](https://www.prepwiser.in/questions/RgqSsoKmnv)

Q25 JEE Main 2022 · 26 Jun · Shift 2

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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/kxGp6g8ckX](https://www.prepwiser.in/questions/kxGp6g8ckX)

Q26 JEE Main 2021 · 26 Feb · Shift 2

A tuning fork A of unknown frequency produces 5 beats/s with a fork of known frequency 340 Hz. When fork A is filed, the beat frequency decreases to 2 beats/s. What is the frequency of fork A?

- (A) 335 Hz (B) 345 Hz
(C) 338 Hz (D) 342 Hz

[Step-by-step solution ► prepwiser.in/questions/oLSpSN2yAb](https://www.prepwiser.in/questions/oLSpSN2yAb)

Intensity and Loudness · 1 PYQs

Q27 JEE Main 2024 · 30 Jan · Shift 2

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Yvr6e-xapH](https://www.prepwiser.in/questions/Yvr6e-xapH)

Resonance · 4 PYQs

Q28 JEE Main 2025 · 3 Apr · Shift 2

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) 370m/s

(B) 340m/s

(C) 335m/s

(D) 360m/s

[Step-by-step solution ► prepwiser.in/questions/e0b4vnPoX8](https://www.prepwiser.in/questions/e0b4vnPoX8)

Q29 JEE Main 2022 · 29 Jun · Shift 2

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 ms^{-1} . The third resonance is observed when the air column has a length of _____ cm.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/U6lcltaY40](https://www.prepwiser.in/questions/U6lcltaY40)

Q30 JEE Main 2022 · 28 Jun · Shift 2

A tuning fork of frequency 340 Hz resonates in the fundamental mode with an air column of length 125 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 ms^{-1})

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/gShiPeWoFz](https://www.prepwiser.in/questions/gShiPeWoFz)

Q31 JEE Main 2020 · 5 Sep · Shift 1

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, the tuning fork frequency is :

(A) 2200 Hz

(B) 3300 Hz

(C) 1100 Hz

(D) 550 Hz

[Step-by-step solution ► prepwiser.in/questions/efLso7ZrWq](https://www.prepwiser.in/questions/efLso7ZrWq)

Answer key — Sound Waves

Numbers match the question numbers above. For full working, open the solution link under each question.

1	C	2	C	3	420	4	B	5	400	6	340	7	200	8	680
9	A	10	C	11	1210	12	2025	13	A	14	132	15	A	16	C
17	C	18	C	19	D	20	D	21	B	22	C	23	6	24	D
25	152	26	A	27	3	28	D	29	104	30	50	31	A		

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