

TEST

JEE Mains PYQS Waves (Physics Master Academy)

QUESTIONS

SECTIONS

1. Section A - 25 Questions

Section 1 : Section A - 25 Questions

SECTION INSTRUCTIONS

This section contains 25 MCQs. +4 for every correct answer, -1 for every incorrect answer.

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

- 1
- 2
- 3
- 4

Correct: +4 · Incorrect: -1

2 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 $A_1 = 12\text{mm}$ and $A_2 = 5\text{mm}$, $x_0 = 3.5\text{cm}$ and wave number $k = 6.28 \text{ cm}^{-1}$. The amplitude of resulting wave will be $\underline{\hspace{1cm}}$ mm.

- 5
- 6
- 9
- 7

Correct: +4 · Incorrect: -1

3 A sound wave of frequency 245Hz travels with the speed of 300ms^{-1} along the positive x axis. Each point of the wave moves to and fro

through a total distance of 6cm. What will be mathematical expression of this travelling wave?

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

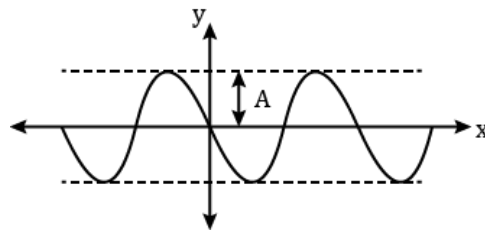
$Y(x, t) = 0.03[\sin 5.1x - (1.5 \times 10^3)t]$

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

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

Correct: +4 · Incorrect: -1

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



For this wave, the phase ϕ is

$-\frac{\pi}{2}$

π

0

$\frac{\pi}{2}$

Correct: +4 · Incorrect: -1

5 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?

The wave is propagating along the negative x axis with speed 25 ms^{-1}

The wave is propagating along the positive x axis with speed 100 ms^{-1}

The wave is propagating along the positive x axis with speed 25 ms^{-1}

The wave is propagating along the negative x axis with speed 100 ms^{-1}

Correct: +4 · Incorrect: -1

6 A tuning fork is vibrating at 250 Hz . The length of the shortest closed organ pipe that will resonate with the tuning fork will be $__ \text{ cm}$, (take speed of sound in air as 340 ms^{-1})

- 30
- 32
- 33
- 34

Correct: +4 · Incorrect: -1

7 In a resonance tube experiment when the tube is filled with water up to a height of 17.0cm 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 24.5cm. If the velocity of sound in air is 330m/s, the tuning fork frequency is

- 2200Hz
- 550Hz
- 1100Hz
- 3300Hz

Correct: +4 · Incorrect: -1

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

- 10N
- 7.5N
- 12.5N
- 5N

Correct: +4 · Incorrect: -1

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

- 21.m
- 1.1m
- 8.1m

6 5.1m

10 A tuning fork of frequency 480Hz 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

- 332 ms^{-1}
- 384 ms^{-1}
- 338 ms^{-1}
- 379 ms^{-1}

Correct: +4 · Incorrect: -1

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

- 6
- 4
- 7
- 5

Correct: +4 · Incorrect: -1

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

- 32cm
- 40cm
- 28cm
- 36cm

Correct: +4 · Incorrect: -1

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

- 335Hz
- 338Hz

345Hz

342Hz

Correct: +4 · Incorrect: -1

14 A student is performing the experiment of resonance column. The diameter of the column tube is 6cm. The frequency of the tuning fork is 504Hz. Speed of the sound at the given temperature is 336 m/s. The zero of the metre 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

13cm

16.6cm

14.8cm

18.4cm

Correct: +4 · Incorrect: -1

15 Three harmonic waves having equal frequency ν and same intensity I_0 have phase angles $0, 3/4$ and $\pi/4$ respectively. When they are superimposed the intensity of the resultant wave is close to

$5.8 I_0$

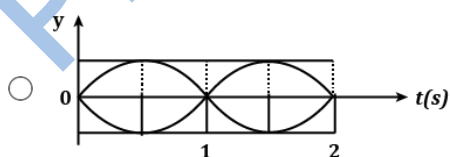
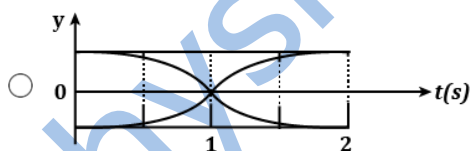
$0.2 I_0$

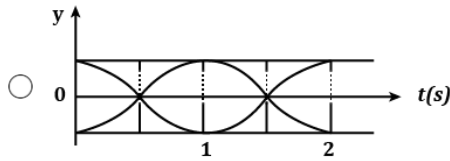
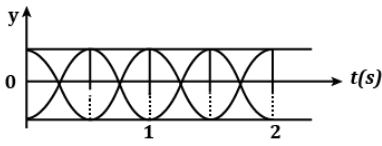
$3 I_0$

I_0

Correct: +4 · Incorrect: -1

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





Correct: +4 · Incorrect: -1

17 A tuning fork vibrates with frequency 256Hz and given one beat per second with the third normal mode of vibrating of an open pipe. What is the length of the pipe? (speed of sound in air is 340 ms^{-1})

- 190cm
- 180cm
- 220cm
- 200cm

Correct: +4 · Incorrect: -1

18 Two cars X and Y are approaching each other with velocities 36km/h and 72km/h respectively. The frequency of a whistle sound as emitted by a passenger in car X, heard by the passenger in car Y is 1320Hz. If the velocity of sound in air is 240m/s, the actual frequency of the whistle sound produced is ___Hz.

- 1205
- 1210
- 1215
- 1250

Correct: +4 · Incorrect: -1

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

- 2005
- 2015
- 2025

2050

Correct: +4 · Incorrect: -1

20 A driver in a car approaching a vertical wall notices that the frequency of his car horn has changed from 440Hz to 480Hz, when its gets reflected from the wall. IF the speed of sound in air is 345m/s. then the speed of the car is

54km/h

36 km/h

18 km/h

24 km/h

Correct: +4 · Incorrect: -1

21 magnetic materials used for making permanent magnets (P) and magnets in a transformers (T) have different properties of the following, which property best matches for the type of magnet required?

T: Large retentivity, small coercivity

P: Small retentivity, large coercivity

T: Large retentivity, large coercivity

P: Large retentivity, large coercivity

Correct: +4 · Incorrect: -1

22 Two sources of sound S_1 and S_2 produce sound waves of same frequency 660Hz. A listener is moving from source S_1 towards S_2 with a constant speed u m/s and he hears 10 beats/s. The velocity of sound is 330m/s. Then u equal

5.5m/s

15.0m/s

2.5m/s

10.0m/s

Correct: +4 · Incorrect: -1

23 A source of sound S is moving with a velocity of 50m/s towards a stationary observer. The observer measures apparent frequency of the source as 1000Hz. 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 350m/s)

750Hz

- 857Hz
- 1143Hz
- 807Hz

Correct: +4 · Incorrect: -1

24 Two cars A and B are moving away from each other in opposite directions. Both the cars are moving with a speed of 20 ms^{-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 ms^{-1})

- 2250Hz
- 2060Hz
- 2300Hz
- 2150Hz

Correct: +4 · Incorrect: -1

25 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

- 430Hz
- 428Hz
- 422Hz
- 420Hz

Correct: +4 · Incorrect: -1

TEST

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ANSWERS

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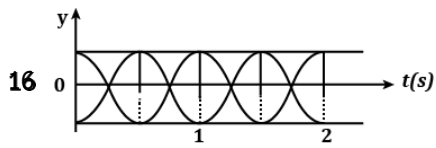
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