

PART 1 - PHYSICS

Topic : Waves

SECTION-A : (Maximum Marks : 12)

This section contains **THREE** questions.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

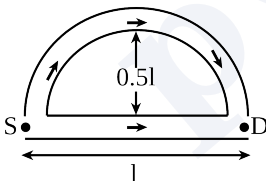
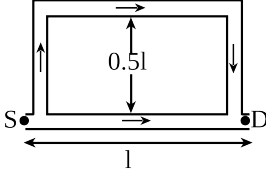
Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

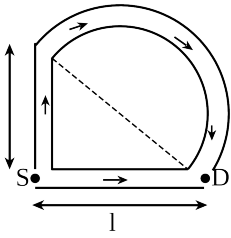
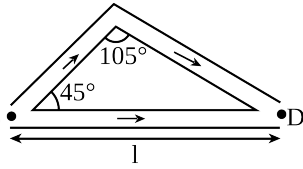
Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. **List-I** shows four configurations made of straight and semi-circular narrow tubes containing air. A sound wave of wavelength $\lambda = 0.29$ m enters these structures at the point S and a sound detector is placed at D. Between the points S and D, the sound travels only through the tubes. **List-II** contains the possible smallest values of l (refer to the figures) for which the detector D records maximum amplitude. Ignore effects of sharp corners. [Given $\cos(15^\circ) = 0.97$]

List-I		List-II	
P.		1.	1.32 m
Q.		2.	1.19 m

Space for Rough Work

List-I		List-II	
R.		3.	0.51 m
S.		4.	0.29 m
		5.	0.13 m

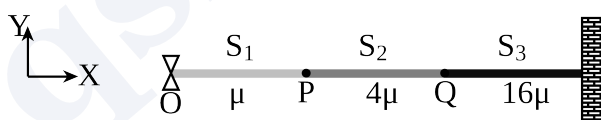
Choose the option that best describes the match between the entries in List-I to those in List-II. [JEE Advanced 2026 Paper 1]

- (A) $P \rightarrow 4, Q \rightarrow 3, R \rightarrow 5, S \rightarrow 1$ (B) $P \rightarrow 4, Q \rightarrow 3, R \rightarrow 1, S \rightarrow 5$
 (C) $P \rightarrow 3, Q \rightarrow 4, R \rightarrow 1, S \rightarrow 2$ (D) $P \rightarrow 3, Q \rightarrow 4, R \rightarrow 5, S \rightarrow 2$

Scan or tap for the full solution 

2. Consider a system of three connected strings, S_1 , S_2 and S_3 with uniform linear mass densities μ kg/m, 4μ kg/m and 16μ kg/m, respectively, as shown in the figure. S_1 and S_2 are connected at the point P, whereas S_2 and S_3 are connected at the point Q, and the other end of S_3 is connected to a wall. A wave generator O is connected to the free end of S_1 . The wave from the generator is represented by $y = y_0 \cos(\omega t - kx)$ cm, where y_0 , ω and k are constants of appropriate dimensions. Which of the following statements is/are correct:

[JEE Advanced 2025 Paper 1]

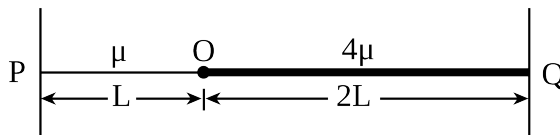


- (A) When the wave reflects from P for the first time, the reflected wave is represented by $y = \alpha_1 y_0 \cos(\omega t + kx + \pi)$ cm, where α_1 is a positive constant.
 (B) When the wave transmits through P for the first time, the transmitted wave is represented by $y = \alpha_2 y_0 \cos(\omega t - kx)$ cm, where α_2 is a positive constant.
 (C) When the wave reflects from Q for the first time, the reflected wave is represented by $y = \alpha_3 y_0 \cos(\omega t - kx + \pi)$ cm, where α_3 is a positive constant.
 (D) When the wave transmits through Q for the first time, the transmitted wave is represented by $y = \alpha_4 y_0 \cos(\omega t - 4kx)$ cm, where α_4 is a positive constant.

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3. Two uniform strings of mass per unit length μ and 4μ , and length L and $2L$, respectively, are joined at point O , and tied at two fixed ends P and Q , as shown in the figure. The strings are under a uniform tension T . If we define the frequency $\nu_0 = \frac{1}{2L} \sqrt{\frac{T}{\mu}}$, which of the following statement(s) is(are) correct? [JEE Advanced 2024 Paper 1]



- (A) With a node at O , the minimum frequency of vibration of the composite string is ν_0 .
 (B) With an antinode at O , the minimum frequency of vibration of the composite string is $2\nu_0$.
 (C) When the composite string vibrates at the minimum frequency with a node at O , it has 6 nodes, including the end nodes.
 (D) No vibrational mode with an antinode at O is possible for the composite string.

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SECTION-B : (Maximum Marks : 8)

This section contains **TWO** questions.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -0.30, 30.27, -127.30) in the place designated to enter the answer.

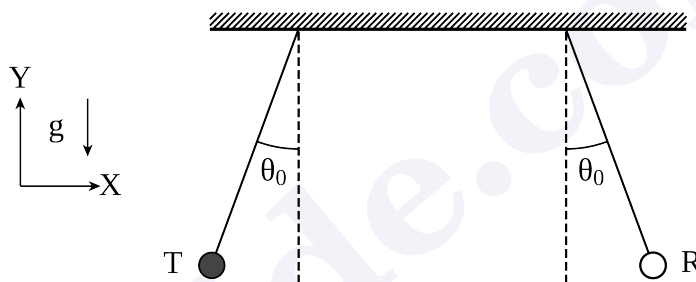
Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

4. An audio transmitter (T) and a receiver (R) are hung vertically from two identical massless strings of length 8 m with their pivots well separated along the X axis. They are pulled from the equilibrium position in opposite directions along the X axis by a small angular amplitude $\theta_0 = \cos^{-1}(0.9)$ and released simultaneously. If the natural frequency of the transmitter is 660 Hz and the speed of sound in air is 330 m/s, the maximum variation in the frequency (in Hz) as measured by the receiver (Take the acceleration due to gravity $g = 10 \text{ m/s}^2$) is ____

[JEE Advanced 2025 Paper 2]

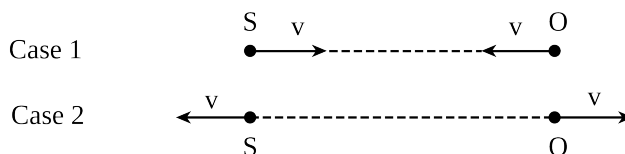


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5. A source (S) of sound has frequency 240 Hz. When the observer (O) and the source move towards each other at a speed v with respect to the ground (as shown in Case 1 in the figure), the observer measures the frequency of the sound to be 288 Hz. However, when the observer and the source move away from each other at the same speed v with respect to the ground (as shown in Case 2 in the figure), the observer measures the frequency of sound to be n Hz. The value of n is ____.

[JEE Advanced 2024 Paper 1]



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JEE ADVANCED WAVES — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A

Ques.	1	2	3													
Ans.	D	A, D	A, C, D													

SECTION-B

Ques.	4	5														
Ans.	26 to 33	200														