

PART 1 - PHYSICS

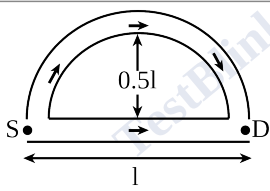
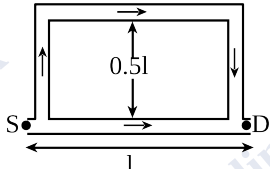
Topic : Waves

SECTION-A : (Maximum Marks : 12)

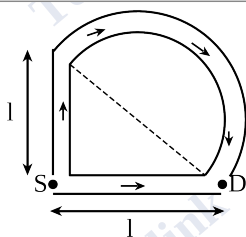
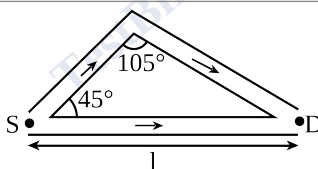
- This section contains **THREE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be 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]

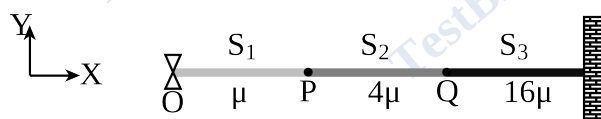
- (A) $P \rightarrow 4, Q \rightarrow 3, R \rightarrow 5, S \rightarrow 1$ (B) $P \rightarrow 4, Q \rightarrow 3, R \rightarrow 1, S \rightarrow 5$
 (C) $P \rightarrow 3, Q \rightarrow 4, R \rightarrow 1, S \rightarrow 2$ (D) $P \rightarrow 3, Q \rightarrow 4, R \rightarrow 5, S \rightarrow 2$

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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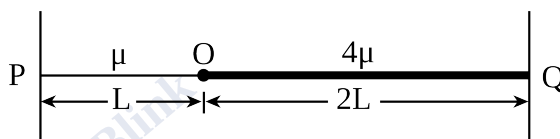


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PYQSide

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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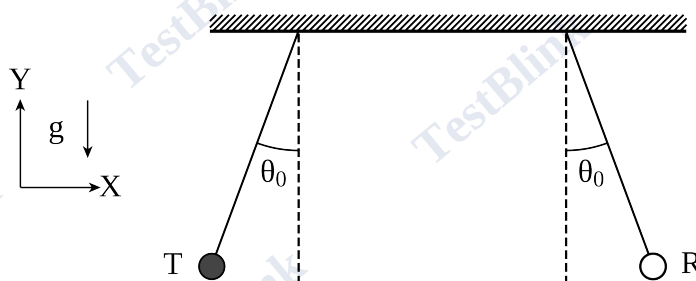


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SECTION-B : (Maximum Marks : 8)

- 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.

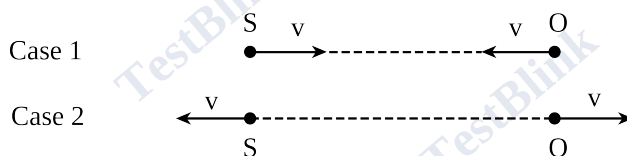
4. An audio transmitter (T) and a receiver (R) are hung vertically from two identical massless strings of length 8 m with their pivots well separated along the X axis. They are pulled from the equilibrium position in opposite directions along the X axis by a small angular amplitude $\theta_0 = \cos^{-1}(0.9)$ 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															