## SINGLE CORRECT ANSWER TYPE QUESTIONS :

**1.** Two vibrating strings of the same material but length L and **2L** having radii **2*r*** and ***r*** respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental modes, one of length L with frequency $f_1$ and other with frequency $f_2$. The ratio $f_1/f_2$ is given by

*(a)* 2 *(b)* 4

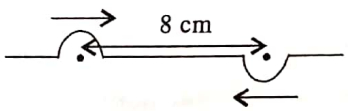
*(c)* 8 *(d)* 1 **[IIT-JEE–2000]**

A train moves towards a stationary observer with speed **34m/s**. The train sounds a whistle and its frequency registered by the observer is $f_1$. If the train's speed is reduced to **17 m/s**, the frequency registered is $f_2$, then the ratio $f_1/f_2$ is

*(a)* 18/19 *(b)* 1/2

*(c)* 2 *(d)* 19/18 **[IIT-JEE–2000]**

**Two pulses** in a stretched string whose centers are initially **8 cm** apart are moving towards each other as shown in figure. The speed of each pulse is **2 cm/s**. After **2 seconds,** the **total energy** of the pulses will be




*(a)* zero

*(b)* purely kinetic

*(c)* purely potential

*(d)* partly kinetic and partly potential **[IIT-JEE–2001]**

**4.** The ends of a stretched wire of length **L** are fixed at $x = 0$ and $x = L$. In one experiment, the displacement of the wire is $y_1 = A \sin\left(\frac{\pi x}{L}\right) \sin \omega t$ and energy is $E_1$ and in another experiment its displacement is $y_2 = A \sin\left(\frac{2\pi x}{L}\right) \sin 2\omega t$ and its energy is $E_2$. Then

*(a)* $E_2 = E_1$ *(b)* $E_2 = 2E_1$

*(c)* $E_2 = 4E_1$ *(d)* $E_2 = 16E_1$

**[IIT-JEE–2001]**

**5.** A sonometer wire resonates with tuning fork forming standing waves with five antinodes between two bridges when a mass of **9 kg** is suspended from the wire. When this mass is replaced by a mass **M**, the wire resonates with the same tuning fork forming **three nodes** for the same positions of the bridges. The value of **M** is

*(a)* 25 kg *(b)* 5 kg

*(c)* 12·5 kg *(d)* (1/25) kg

**[IIT-JEE–2002]**

**6.** A siren placed at railway platform is emitting sound of frequency **5 kHz**. A passenger sitting in a moving **train** A records a frequency of **5·5 kHz** while the train approaches the siren. During his return journey in a different train B he records a frequency of 6·0 kHz while approaching the same siren. The **ratio of velocity** of the **train B** to that of **train A** is

*(a)* $\frac{242}{253}$ *(b)* 2

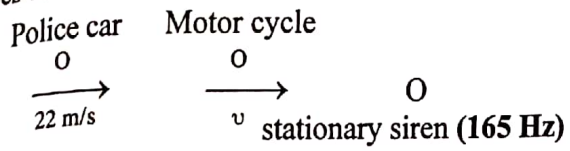
*(c)* $\frac{5}{6}$ *(d)* $\frac{11}{6}$ **[IIT-JEE–2002]**

In the experiment for the determination of the speed of sound in air using the resonance column method, the length of air column that resonates in the fundamental mode, with a tuning fork is 0·1 m. When this length is changed to **0·35 m** the same **tuning fork resonates** with **first overtone**. Calculate the end correction.

(a) 0·012 m (b) 0·025 m
(c) 0·05 m (d) 0·024 m

**[IIT-JEE–2003]**

8. A police car moving at **22 m/s**, chases a motor cyclist. The policeman sounds his horn at **176 Hz**, while both of them move towards a stationary siren of frequency **165 Hz**. Calculate the speed of the motor cycle, if it is given that he does not observe any beat.




(a) 33 m/s (b) 22 m/s
(c) zero (d) 11 m/s

**[IIT-JEE–2003]**

9. A source of sound of frequency **600 Hz** is placed inside water. The speed of sound in water is **1500 m/s** and in air it is **300 m/s**. The frequency of sound as recorded by an observer standing in air is

(a) 200 Hz (b) 3000 Hz
(c) 120 Hz (d) 600 Hz

**[IIT-JEE–2004]**

10. A pipe of length $l_1$, closed at one end, is kept in a chamber of gas of density $\rho_1$. A second pipe open at both ends is placed in a second chamber of gas of density $\rho_2$. The compressibility of both gases is equal. Calculate the length of second pipe if frequency of **first overtone** in **both the gases is equal**

(a) $\frac{4}{3} l_1 \sqrt{\frac{\rho_2}{\rho_1}}$ (b) $\frac{4}{3} l_1 \sqrt{\frac{\rho_1}{\rho_2}}$

(c) $l_1 \sqrt{\frac{\rho_2}{\rho_1}}$ (d) $l_1 \sqrt{\frac{\rho_1}{\rho_2}}$

**[IIT-JEE–2004]**

11. An open pipe is in resonance in second harmonic with frequency $f_1$. Now one end of the tube is closed and frequency is increased to $f_2$ such that the resonance again occurs in $n$th harmonic. Choose the correct option.

(a) $n = 3, f_2 = \frac{3}{4} f_1$ (b) $n = 3, f_2 = 5/4 f_1$

(c) $n = 5, f_2 = \frac{3}{4} f_1$ (d) $n = 5, f_2 = 5/4 f_1$

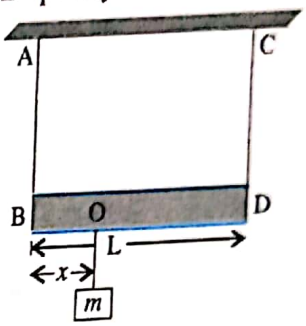
**[IIT-JEE–2005]**

12. In a resonance tube with tuning fork of frequency 512 Hz, first resonance occurs at water level equal to 30·3 cm and second resonance occurs, at 63·7 cm. The maximum possible error in the speed of sound is

(a) 5·12 m/s (b) 102·4 cm/s
(c) 204·8 cm/s (d) 153·6 cm/s

**[IIT-JEE–2005]**

13. A massless rod of length L is suspended by two identical strings AB and CD of equal length. A block of mass $m$ is suspended from point O such that BO = $x$. Further it is observed that frequency of 1st harmonic in AB is equal to 2nd harmonic frequency in CD. $x$ is



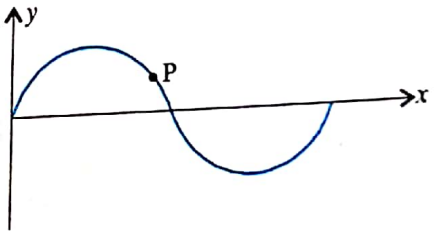

(a) $\frac{L}{5}$ (b) $\frac{4L}{5}$

(c) $\frac{3L}{5}$ (d) $\frac{L}{4}$ **[IIT-JEE–2006]**

14. In the experiment to determine the speed of sound using a **resonance column**

(a) prongs of the tuning fork are kept in a vertical plane.
(b) prongs of the tuning fork are kept in a horizontal plane.
(c) in one of the two resonances observed, the length of the resonating air column is close to the wavelength of sound in air.
(d) in one of the two resonances observed, the length of the resonating air column is close to half of the wavelength of sound in air. **[IIT-JEE–2007]**

15. A transverse sinusoidal wave moves along a string in the **positive $x$-direction** at a speed of **10 cm/s**. The wavelength of wave is **0·5 m** and its amplitude is **10 cm**. At a particular time $t$, the snap-shot of the wave is shown in the figure. The **velocity of point P**, when its displacement is **5 cm** is




(a) $\frac{\sqrt{3}\pi}{50} \hat{j}$ m/s (b) $-\frac{\sqrt{3}\pi}{50} \hat{j}$ m/s

(c) $\frac{\sqrt{3}\pi}{50} \hat{i}$ m/s (d) $-\frac{\sqrt{3}\pi}{50} \hat{i}$ m/s

**[IIT-JEE–2008]**