ఈనాడు
మంగళవారం 19 మే 2020 ■ email: help@eenadupratibha.net
ప్రతిభ

The speed of the source is?

Waves

1. A horizontal platform is executing SHM in the vertical direction of frequency υ. A block of mass m is placed on the platform. What is the maximum amplitude of the platform so that the block is not detached from it?

1) $\frac{mg}{2\pi^2\upsilon^2}$ 2) $\frac{g}{2\pi^2\upsilon^2}$
3) $\frac{mg}{4\pi^2\upsilon^2}$ 4) $\frac{g}{4\pi^2\upsilon^2}$

2. A simple pendulum of bob mass m is oscillating with an angular amplitude α_m (in radians). Then the maximum tension in the string is ....

1) mg 2) mg α_m 3) $mg\alpha_m^2$ 4) $mg(1 + \alpha_m^2)$

3. Standing waves are produced by the superposition of two waves y_1 = 0.05 sin $(3\pi t - 2x)$, $y_2 = 0.05 \sin(3\pi t + 2x)$ where x and y are expressed in meters and t is in seconds. What is the amplitude of the particle at x = 0.5 m? [Given cos (57.3°) = 0.54].

1) 0.54 cm 2) 5.4 cm 3) 0.45 cm 4) 4.5 cm

Writer
K.S.S. Rajasekhar
Subject Expert

4. Two persons A and B, each carrying a source of sound of frequency υ, are standing a few meters apart in a quiet field. A starts moving towards B with a speed u. If v is the speed of sound, then the number of beats heard per second by A will be

1) $\upsilon\cdot\frac{u}{v}$ 2) $\upsilon\cdot\frac{v}{u}$ 3) $\upsilon\left(1 + \frac{u}{v}\right)$ 4) $\upsilon\left(1 + \frac{v}{u}\right)$

5. The bob of a simple pendulum has a mass m and it is executing SHM of amplitude A and period T. It collides with a body of mass m_0 placed at the equilibrium position which sticks to the bob. Then the time period of the oscillation of the combined masses will be

1) T 2) 2T 3) $T\sqrt{\frac{m}{m + m_0}}$ 4) $T\sqrt{\frac{m + m_0}{m}}$

6. A simple pendulum of length l is suspended from the ceiling of a trolley which is moving, without friction, down an inclined plane of inclination θ. The time period of the pendulum is given by, $T = 2\pi\sqrt{\frac{l}{g'}}$, where g' is given by

1) g 2) g cosθ 3) g sinθ 4) g tanθ

7. A sonometer wire is stretched by a hanging metal bob. Its fundamental frequency is υ_1. When the bob is completely immersed in water, the frequency becomes υ_2. Then the relative density of the metal is

1) $\frac{\upsilon_2}{\upsilon_1 - \upsilon_2}$ 2) $\frac{\upsilon_1}{\upsilon_1 - \upsilon_2}$
3) $\frac{\upsilon_2^2}{\upsilon_1^2 - \upsilon_2^2}$ 4) $\frac{\upsilon_1^2}{\upsilon_1^2 - \upsilon_2^2}$

8. One end of a long metallic wire of length L is tied to the ceiling. The other end is tied to a massless spring of spring constant K. A mass m hangs freely from the free end of the spring. The area of cross section and Young's modulus of the wire are A and Y respectively. If the mass is slightly pulled down and released, it will oscillate with a time period of

1) $2\pi\sqrt{\frac{m}{K}}$ 2) $2\pi\left(\frac{mYA}{KL}\right)$
3) $2\pi\left(\frac{mL}{YA}\right)$ 4) $2\pi\left[\frac{(YA + KL)m}{YAK}\right]^{1/2}$

9. Two waves y_1 = A sin[K(x + ct)] and y_2 = A sin[K(x − ct)] are superposed on a string. Then the distance between adjacent nodes is......

1) $\frac{\pi}{K}$ 2) $\frac{\pi}{2K}$ 3) $\frac{ct}{2\pi}$ 4) $\frac{ct}{\pi}$

10. A body executes SHM under the action of a force F_1 with a time period $\frac{4}{5}$ s. If the force is changed to F_2, it executes SHM with time period $\frac{3}{5}$ s. If both the forces F_1 and F_2 act simultaneously in the same direction on the body, its time period in seconds is

1) $\frac{25}{12}$ 2) $\frac{12}{25}$ 3) $\frac{27}{20}$ 4) $\frac{20}{27}$

11. The time period of a particle in SHM is 8 seconds. At t = 0 it is at the mean position. The ratio of the distances travelled by it in the first and second seconds is

1) 1 2) $\frac{1}{\sqrt{2}}$ 3) $\sqrt{2} - 1$ 4) $\frac{1}{\sqrt{2} - 1}$

12. An organ pipe A, closed at one end and containing a gas of density ρ_1 is vibrating in its first harmonic. Another organ pipe B, open at both ends and containing a gas of density ρ_2 is vibrating in its third harmonic. Both the pipes are in resonance with a given tuning fork. If the compressibility of gases is equal in both pipes, then the ratio of the lengths of A and B is ....

1) $\frac{1}{3}$ 2) $\frac{1}{6}\sqrt{\frac{\rho_1}{\rho_2}}$ 3) $\frac{1}{6}\sqrt{\frac{\rho_2}{\rho_1}}$ 4) $\sqrt{\frac{\rho_2}{\rho_1}}$

13. A uniform rope of mass M hangs vertically from a rigid support. A block of mass m is attached to the free end of the rope. A transverse pulse of wave length λ is produced at the lower end of the rope. Then the wavelength of the pulse when it reaches the top of the rope is ......

1) λ 2) $\frac{m\lambda}{M}$ 3) $\left(\frac{m + M}{m}\right)^{1/2}\lambda$ 4) $\left(\frac{m + M}{m}\right)\lambda$

14. A band playing music at a frequency f is moving towards a wall at a speed u. A cyclist is following the band with the same speed u. If v is the speed of sound, then the beat frequency heard by the cyclist is

1) f 2) $\frac{2fu}{u + v}$ 3) $\frac{2fu}{v - u}$ 4) $\frac{f(u + v)}{(v - u)}$

15. The potential energy of a particle executing SHM along the X- axis is given by $U = U_0 - U_0 \cos ax$. What is the period of oscillation?

1) $2\pi\sqrt{\frac{m}{aU_0}}$ 2) $\frac{2\pi}{a}\sqrt{\frac{m}{U_0}}$
3) $2\pi\sqrt{\frac{U_0}{ma}}$ 4) $2\pi\sqrt{\frac{ma}{U_0}}$

16. A particle moves with SHM in a straight line. In the first second starting from rest it travels a distance a and in the next second it travels a distance b in the same direction. Then the amplitude of the motion is

1) $\frac{3a^2}{3b - a}$ 2) $\frac{3a^2}{3a - b}$
3) $\frac{2a^2}{3a - b}$ 4) $\frac{2a^2}{3b - a}$

17. A simple pendulum is making oscillations with its bob immersed in a liquid of density

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n times less than the density of the bob. Then the its period is

1) $2\pi\sqrt{\frac{l}{ng}}$ 2) $2\pi\sqrt{\frac{ln}{g}}$
3) $2\pi\sqrt{\frac{l}{\left(1 - \frac{1}{n}\right)g}}$ 4) $2\pi\sqrt{\frac{l}{(n - 1)g}}$

18. A particle executing SHM has velocities u and v and accelerations a and b in two of its positions. Then the distance between these two positions

1) $\frac{v^2 - u^2}{a - b}$ 2) $\frac{v^2 + u^2}{a - b}$
3) $\frac{u^2 - v^2}{a + b}$ 4) $\frac{v^2 + u^2}{a + b}$

19. The instantaneous displacement x of a particle executing SHM is given by x = $a_1 \sin \omega t + a_2 \cos\left(\omega t + \frac{\pi}{6}\right)$. Then the amplitude of the oscillation is

1) $\sqrt{a_1^2 + a_2^2 - 2a_1a_2 \cos\frac{\pi}{3}}$
2) $\sqrt{a_1^2 + a_2^2 + 2a_1a_2 \cos\frac{\pi}{3}}$
3) $\sqrt{a_1^2 + a_2^2 - 2a_1a_2 \cos\frac{\pi}{6}}$
4) $\sqrt{a_1^2 + a_2^2 + 2a_1a_2 \cos\frac{\pi}{6}}$

20. The difference between the apparent frequencies of source of sound as perceived by a stationary observer during its approach and recession is 2% of the actual frequency of the source. If the speed of sound is 300 m/s, the speed of the source is

1) 3 m/s 2) 4 m/s 3) 5 m/s 4) 6 m/s

21. A siren placed at a railway platform is emitting sound of frequency 5 kHz. A passenger sitting in a moving train P records a frequency of 5.5 kHz while the train approaches the siren. During his return journey in a different train Q, he records a frequency of 6.0 kHz while approaching the same siren. Then the ratio of velocity of train Q to that of train P is

1) $\frac{11}{6}$ 2) 2 3) $\frac{5}{6}$ 4) $\frac{6}{5}$

22. The ratio of intensities between two coherent sound sources is 4 : 1. The difference of loudness in decibels (dB) between maximum and minimum intensities when they interfere in space is

1) 10 log (2) 2) 10 log (3)
3) 20 log (2) 4) 20 log (3)

23. A sound wave of wavelength λ travels towards the right horizontally with a velocity V_1. It strikes and reflects from a vertical plane surface, travelling at a speed V_2 towards the left. Then the number of positive crests striking in a time interval of 3s on the wall is

1) $\frac{(V_1 - V_2)}{3\lambda}$ 2) $\frac{(V_1 + V_2)}{3\lambda}$
3) $\frac{3(V_1 - V_2)}{\lambda}$ 4) $\frac{3(V_1 + V_2)}{\lambda}$

24. Two organ pipes, both closed at one end, have lengths l and $l + \Delta l$. If the velocity of sound in air is V, then the number of beats per second is (neglect the end correction)

1) $\frac{V}{2l}$ 2) $\frac{V}{4l}$ 3) $\frac{V}{2l^2}\cdot\Delta l$ 4) $\frac{V}{4l^2}\cdot\Delta l$

25. The glass tube of 1m length is filled with the water. The water can be drained out slowly at the bottom of the tube. If a vibrating tuning fork of frequency 500 Hz is brought at the upper end of the tube and the velocity of the sound is 330 m/s, then the total number of resonances obtained will be

1) 1 2) 2 3) 3 4) 4

26. A standard tuning fork of frequency υ is used to find the velocity of sound in air by resonance column apparatus. The difference between the two resonating lengths is 1 m. Then the velocity of sound in air is

1) υ m/s 2) $\frac{\upsilon}{2}$ m/s 3) 2υ m/s 4) 3υ m/s

27. If the length of the stretched string is decreased by 40% and the tension is increased by 44%, then the ratio of the final and initial fundamental frequencies is

1) 1 : 2 2) 2 : 1
3) 1 : 1 4) 1 : 3

28. If υ_1, υ_2 and υ_3 are the fundamental frequencies of three segments of stretched string, then the fundamental frequency of the overall string is

1) $\upsilon_1\upsilon_2\upsilon_3$ 2) $\upsilon_1 + \upsilon_2 + \upsilon_3$
3) $[\upsilon_1\upsilon_2\upsilon_3]^{1/3}$ 4) $\left[\frac{1}{\upsilon_1} + \frac{1}{\upsilon_2} + \frac{1}{\upsilon_3}\right]^{-1}$

29. A string is under tension so that the length is increased 1/n times the original length. The ratio of fundamental frequency of longitudinal vibrations and transverse vibrations is

1) 1 : n 2) n : 1
3) $\sqrt{n}$: 1 4) 1 : $\sqrt{n}$

30. An open origin pipe of length l is sounded together with another open organ pipe of length $(l + x)$ in their fundamental tones. If the speed of sound in air is V, the beat frequency heard will be ($x \ll l$)

1) $\frac{Vx^2}{2l}$ 2) $\frac{Vx}{2l^2}$ 3) $\frac{Vl^2}{2x}$ 4) $\frac{Vx}{4l^2}$

31. A point source is emitting sound in all directions. The ratio of distance of two points from the point source where the difference in loudness levels is 3 dB is ($\log_e^{(2)} = 0.3$)

1) $\frac{1}{2}$ 2) $\frac{1}{\sqrt{2}}$ 3) $\sqrt{2}$ 4) 2

Answers

1-4 2-4 3-2 4-1 5-4 6-2 7-4 8-4 9-1 10-2 11-4 12-3 13-3 14-3 15-2 16-3 17-3 18-3 19-1 20-1 21-2 22-4 23-4 24-4 25-3 26-3 27-2 28-4 29-3 30-2 31-2.