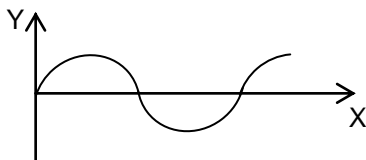


Single Correct Answer Type:

1. In a stationary wave that forms as a result of reflection of waves from an obstacle the ratio of the amplitude at an antinode to the amplitude at node is 'n'. The fraction of energy reflected is _____

(A) $\left(\frac{n-1}{n}\right)^2$ (B) $\left(\frac{n-1}{n+1}\right)^2$ (C) $\left(\frac{1}{n}\right)^2$ (D) $\left(\frac{n}{n+1}\right)^2$

2. In a sine wave position of different particles at time $t = 0$ is shown in fig. The equation for this wave if it is travelling along positive x-axis can be _____



(A) $y = A \sin(\omega t - kx)$ (B) $y = A \sin(kx - \omega t)$
(C) $y = A \cos(\omega t - kx)$ (D) $y = A \cos(kx - \omega t)$

3. A travelling wave is partly reflected and partly transmitted from a rigid boundary. Let a_i , a_r and a_t be the amplitudes of incident wave, reflected wave and transmitted wave and I_i , I_r and I_t be the corresponding intensities. Then choose correct alternative

(A) $\frac{I_i}{I_r} = \left(\frac{a_i}{a_r}\right)^2$ (B) $\frac{I_i}{I_t} = \left(\frac{a_i}{a_t}\right)^2$ (C) $\frac{I_r}{I_t} = \left(\frac{a_r}{a_t}\right)^2$ (D) All the above

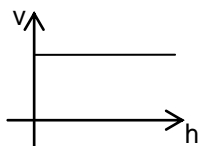
4. Speed of transverse wave in a string of density 100 kg/m^3 and area of cross section 10 mm^2 under a tension of 10^3 N is

(A) 100 ms^{-1} (B) 1000 ms^{-1} (C) 200 ms^{-1} (D) 2000 ms^{-1}

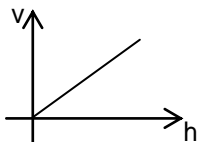
5. A 10 watt source of sound of frequency 1000 Hz sends out waves in air. The displacement amplitude at a distance of 10 m from the source is _____ (Speed of sound in air 340 ms^{-1} , density of air 1.29 kg/m^3)

(A) $0.62 \mu\text{m}$ (B) $4.2 \mu\text{m}$ (C) $1.6 \mu\text{m}$ (D) $0.96 \mu\text{m}$

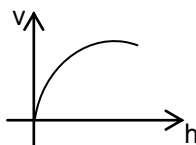
6. A uniform rope having mass 'm' hangs vertically from a rigid support. A transverse wave pulse is produced at the lower end. The speed (v) of wave pulse varies with height (h) from the lower end as _____



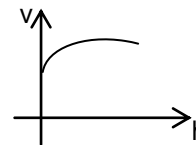
(A)



(B)



(C)



(D)

7. A string of length 'L' is stretched by $L/20$ and speed of transverse wave along it is 'v'. The speed of wave when it is stretched by $\frac{L}{10}$ will be (assume that hooke's law is applicable)

(A) $2v$ (B) $\frac{v}{\sqrt{2}}$ (C) $\sqrt{2}v$ (D) $4v$

8. A string of length 0.4 m and mass 10^{-2} kg is tightly clamped at its ends. The tension in the string is 16N. Identical wave pulses are produced at one end at equal interval of time Δt . The value of Δt which allows constructive interference between successive pulses is _____
 (A) 0.05 sec (B) 0.10 sec (C) 0.20 sec (D) 0.40 sec
9. A source of frequency 10 KHz when vibrated over the mouth of a closed organ pipe is in unison at 300 K. The beats produced when temperature rises by 1 K is _____
 (A) 30 Hz (B) 13.33 Hz (C) 16.67 Hz (D) 40 Hz
10. If λ_1 , λ_2 and λ_3 are the wavelengths of the waves giving resonance with the fundamental, first and second over tones respectively of a closed organ pipe. Then the ratio of wavelengths $\lambda_1 : \lambda_2 : \lambda_3$ is _____
 (A) 1 : 2 : 3 (B) $1 : \frac{1}{3} : \frac{1}{5}$ (C) 1 : 3 : 5 (D) 5 : 3 : 1
11. An open and a closed pipe have same length. The ratio of frequencies of their n^{th} overtone is _____
 (A) $\frac{n+1}{2n+1}$ (B) $\frac{2(n+1)}{2n+1}$
 (C) $\frac{n}{2n+1}$ (D) $\frac{n+1}{2n}$
12. String 1 has twice the length, twice the radius, twice the tension and twice the density of another string 2. The relation between the fundamental frequencies of 1 & 2 is
 (A) $f_1 = 2f_2$ (B) $f_1 = 4f_2$ (C) $f_2 = 4f_1$ (D) $f_1 = f_2$
13. For a certain organ pipe three successive resonance frequencies are observed at 425 Hz, 595 Hz and 765 Hz respectively. If the speed of sound in air is 340 ms^{-1} then the length of the pipe is _____
 (A) 2 m (B) 0.4 m (C) 1 m (D) 0.2 m
14. In an experiment it was found that string vibrates in 'n' loops when a mass 'M' is placed on the pan. What mass should be placed on the pan to make it vibrate in '2n' loops with same frequency
 (A) 2M (B) $\frac{M}{4}$ (C) 2M (D) $\frac{M}{2}$
15. A wave represented by the equation $y_1 = A \cos(kx - \omega t)$ is superimposed with another wave to form a stationary wave such that the point $x = 0$ is a node. The equation of the other wave is _____
 (A) $y_2 = -A \sin(kx - \omega t)$ (B) $y_2 = -A \cos(kx + \omega t)$
 (C) $y_2 = A \sin(kx + \omega t)$ (D) $y_2 = A \cos(kx + \omega t)$
16. The equation for the vibration of a string fixed at both ends vibrating in its third harmonic is given by $y = 2 \text{ cm} \sin\left[\left(0.6 \text{ cm}^{-1}\right)x\right] \cos\left[\left(500 \pi \text{ s}^{-1}\right)t\right]$ the length of the string is _____
 (A) 24.6 cm (B) 12.5 cm (C) 20.6 cm (D) 15.7 cm
17. An open organ pipe of length ' ℓ ' is sounded together with another open organ pipe of length $\ell + x$ in their fundamental tones. Speed of sound in air is 'V' the beat frequency heard will be ($x \ll \ell$)
 (A) $\frac{Vx}{4\ell^2}$ (B) $\frac{V\ell^2}{2x}$ (C) $\frac{Vx}{2\ell^2}$ (D) $\frac{Vx^2}{2\ell}$
18. A conveyor belt moves to the right with speed $V = 300 \text{ m/min}$. A person puts pies on the belt at a rate of 20 per minute while walking with speed 30 m/min towards a receiver at the other end. The frequency with which they are received by the stationary receiver is _____
 (A) 26.67 permin (B) 30 permin (C) 22.22 permin (D) 24 permin

19. A string of mass 0.2 kg/m has length $\ell = 0.6 \text{ m}$ is fixed at both ends and stretched such that it has a tension of 80 N . The string vibrates in 3 segments with maximum amplitude of 0.5 cm . The maximum transverse velocity amplitude is _____
- (A) 1.57 ms^{-1} (B) 6.28 ms^{-1} (C) 3.14 ms^{-1} (D) 9.42 ms^{-1}
20. Two sound waves move in the same direction. If the average power transmitted across a cross section by them are equal while their wavelengths are in the ratio of $1 : 2$. Their pressure amplitudes would be in the ratio of _____
- (A) 1 (B) 2 (C) 4 (D) $\frac{1}{2}$

Numerical Based:

21. An open pipe is suddenly closed at one end with the result that the frequency of third harmonic of the closed pipe is found to be higher by 100 Hz . Then the fundamental frequency of the open pipe is $n(100 \text{ Hz})$. Value of 'n' is _____
22. A whistle giving out 450 Hz approaches a stationary observer at a speed of 33 ms^{-1} . The frequency heard by the observer in Hz is $250x$. Value of 'x' is _____
23. A siren placed at a 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 the velocity of train B to that of the train A is _____
24. Two vibrating strings of the same material but lengths L and $2L$ have radii $2r$ and r respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental notes, the one of lengths L with frequency f_1 and the other with frequency f_2 . The ratio of the f_1/f_2 is _____
25. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km . It blows a whistle whose echo is heard by the driver after 5 sec . If the speed of sound in air is 330 ms^{-1} . Then the speed of the engine is $6x$. Value of 'x' is _____

KEY

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|-------|-------|-------|-------|-------|
| 1. B | 2. B | 3. A | 4. B | 5. D |
| 6. C | 7. C | 8. B | 9. C | 10. B |
| 11. B | 12. C | 13. C | 14. B | 15. B |
| 16. D | 17. C | 18. C | 19. A | 20. A |
| 21. 2 | 22. 2 | 23. 2 | 24. 1 | 25. 5 |