PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

STATIONARY WAVES

Multiple Choice Questions Standard Level

1. At a certain instant a stationary transverse wave is found to have maximum kinetic energy. The appearance of string at that instant is

A. of sinusoidal shape with amplitude A

B. of sinusoidal shape with amplitude $\frac{A}{2}$

C. a straigth line

D. of sinusoidal shape with amplitude $\frac{A}{4}$

Answer: C

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2. Sound waves of frequency $660Hz$ fall normally on a perfectly reflecting wall. The shortest distance from the wall at which the air particles have maximum amplitude of vibration is ..... meters.

A. $\frac{1}{2}m$

B. $\frac{1}{4}m$

C. $\frac{1}{8}m$

D. $\frac{1}{16}m$

Answer: C

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3. The equation of standing wave is $y = 0.1\cos(\pi x)\sin(200\pi t)$. What is the frequency of the wave?

A. 100 Hz

B. 50 Hz

C. 25 Hz

D. 200 Hz

Answer: A

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4. The equation of stationary wave along a stretched string is given by $y = 5\sin\left(\frac{\pi x}{3}\right)\cos 40\pi t$, where x and y are in cm and t in second. The separation between two adjacent nodes is

A. 3 cm

B. 4 cm

C. 5 cm

D. 6 cm

Answer: A

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5. A stationary sound wave has a frequency of 165 Hz. If the speed of sound in air is 330 m/s , then the distance between a node and the adjacent antinode is

A. 30 cm

B. 40 cm

C. 50 cm

D. 60cm

Answer: C

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6. Fine the wrong statement from the following :

The equation of a stationary wave is given by $y = 6\cos\left(\frac{\pi x}{5}\right)\sin(40\pi x)$,where y and x are in cm and t is in second. Then for the stationary wave,

A. Amplitude =3 cm

B. Wavelenghts =5 cm

C. Frequency = 20 Hz

D. Velocity =2 m/s

Answer: B

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7. Stading waves are produced by the superposition of two waves give by $y_1 0.4 \sin 2\pi\left(\frac{t}{0.6} - \frac{x}{0.3}\right)$ and $y_2 = 0.4 \sin 2\pi\left(\frac{t}{0.6} + \frac{x}{0.3}\right)$ where all the quantities are expressed in SI units. What is the amplitude of a particle at $x = 0.5m$?

A. $0.2m$

B. $0.3m$

C. $0.4m$

D. $0.5m$

Answer: C

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8. A wave frequency $100Hz$ travels along a string towards its fixed end . When this wave travels back after reflection , a node is formed

at a distance of $10cm$from the fixed end . The speed of the wave (incident and reflected) is

A. $5m/s$

B. $10m/s$

C. $20m/s$

D. $40m/s$

Answer: C

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9. The equation of standing wave along a sonometer wire is given by $y = 2A\cos\left(\frac{2\pi x}{\lambda}\right)\sin\omega t.$

This represent a standing wave having the origing as

A. a node

B. an antinode

C. either a node or an antinode

D. neither a node nor an antinode

Answer: B

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10. For a stationary wave, $t = 8\sin\left(\frac{\pi x}{20}\right)\cos(50\pi t)$. What is the distance between two successive antinode ?

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer: B

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11. A stationary wave is incident on a rigid wall. If the velocity of the wave is 40 cm and the frequency is 120 Hz. Then the distance between the wall and the first antinods is

A. $\frac{1}{2}m$

B. $\frac{1}{3}m$

C. $\frac{1}{6}m$

D. $\frac{1}{12}m$

Answer: D

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12. A standing wave with a number of loops is produced in a stringe fiex at both ends. In this case

A. all particles vibrate in phase

B. particles at all antinodes vibrate in phase

C. particles at alternate antinodes vibrate in phase

D. particles between two consecutive antinodes vibrate in phase

Answer: C

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13. The equation of a stationary wave is given by $y = 0.5cm\cos(2\pi x)\sin(100\pi t)$. The distance between its successive nodes and antinods is

A. $0.25cm$

B. $0.75cm$

C. $0.5cm$

D. $1m$

Answer: C

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14. A standing wave is given by $y = 5\sin\frac{\pi x}{20}\cos 40\pi t$, where x and y are in cm and t is in second. What is the minimum distance between a node and the adjacent antinode ?

A. 5 cm

B. $7.5cm$

C. $10cm$

D. 15 cm

Answer: C

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15. A vibrating string is tied at its two ends. The equation of the wave produced on the string is given by $y = \cos(2\pi t)\sin(2\pi x)$

What is the lenghts of the string,f it is in the fundamental node of vibration ?

A. 1 m

B. $0.5m$

C. $0.75m$

D. $1.5m$

Answer: B

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16. A standing wave is represeneted by $y = a\sin(100t)\cos(0.01)x$, t in second and x is in metre. Velocity of wave is

A. 1 m/s

B. Not derivable from the above data

C. $10^4 m/s$

D. $10^{-4} m/s$

Answer: C

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17. In stationary wave the

A. energy is maximum at nodes and maximum at antinodes

B. energy is uniformly distributed

C. alternating maximum and minimum energies are produced at nodes and antinodes

D. energy is minimum at nodes and maximum at antinodes

Answer: D

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18. Stationary waves of frequency 300 Hz are formed in a medium in which the velocity of sound is 1200 metre / sec . The distance between a node and the neighbouring antinode is

A. 1 m

B. 2 m

C. 3 m

D. 4 m

Answer: A

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19. The phase at different in a stationary wave are

A. differenet at different points

B. same at all points

C. the same at all point between two successive nodes

D. the same at all point between successive antinodes

Answer: C

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20. A wave representing by the equation $y = a\cos(kx - \omega t)$ is suerposed with another wave to form a stationary wave such that point $x = 0$ is a node. The equation for the other wave is

A. $\sin(Kx + \omega t)$

B. $-a\cos(Kx - \omega t)$

C. $-a\cos(Kx-\omega t)$

D. $-a\sin(Kx-\omega t)$

Answer: C

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21. The transverse displacement of a string (clamped at its both ends) is given by $y(x,t)=0.06\sin(2\pi x/3)\cos(120\pi t)$.

All the points on the string between two consecutive nodes vibrate with

A. same frequency

B. same phase

C. same energy

D. different amplitudes

Answer: C

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22. The stationary wave $y = 2a \sin kx \cos \omega t$ in a closed organ pipe is the result of the superposition of $y = a \sin(\omega t - kx)$

A. $y = a \cos(\omega t + Kx)$

B. $y = a \sin(\omega t + Kx)$

C. $y = -a \sin(\omega t + Kx)$

D. $y = -a \cos(\omega t + Kx)$

Answer: C

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Multiple Choice Questions Higher Level

1. Two sinusoidal waves having the same wavlength of the wave, if the minimum time interval between two instance when the string becomes flat, is $0.8s$?

A. 10 m

B. 5 m

C. 8 m

D. 2 m

Answer: C

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2. The equation of a stationary wave on a string clamped at both ends and vibrating in its third harmonic is given by $y = 0.5\sin(0.314x)\cos(600\pi t)$

where x and y are in cm and t is in sec. What is the

length of the string?

A. 10 cm

B. 20 cm

C. 30 cm

D. 40 cm

Answer: C

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3. The linear density of a vibrating string is $1.3 \times 10^{-4} kg/m$ A transverse wave is propagating on the string and is described by the equation $y = 0.021 \sin(x + 30t)$ where x and y are measured in meter and tt in second the tension in the string is :-

A. $1.2N$

B. $0.12N$

C. $0.48N$

D. $4.8N$

Answer: B

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4. A wave $y = a\sin(\omega t - kx)$ on a string meets with another wave producing a node at $x = 0$. Then the equation of the unknown wave is

A. $y = -a\sin(\omega t - Kx)$

B. $y = a\sin(\omega t - Kx)$

C. $y = -a\sin(\omega t + Kx)$

D. $y = a\sin(\omega t + Kx)$

Answer: C

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5. The displacement of a string fixed at both the ends is given by

$$y = 0.8 \sin\left(\frac{\pi x}{3}\right) \cos(60\pi t)$$

where y and x in metres and t is in second. What is the wavelength and frequency of the two interfering waves ?

A. 2m, 60 Hz

B. 6 m 30 Hz

C. 12m, 30 Hz

D. 3m, 60 Hz

Answer: B

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6. Three waves y_1, y_2, y_3 are given by $y_1 = A\sin(Kx - \omega t), y_2 A = \sin(Kx + \omega t)$ and $y_3 = A\sin(Ky - \omega t)$. Which one of the following represents wave ?

A. $y_1 + y_2 + y_3$

B. $y_1 + y_3$

C. $y_1 + y_2$

D. $y_2 + y_3$

Answer: C

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7. A wave disturbance in a medium is described by $y(x, t) = 0.02\cos\left(50\pi t + \frac{\pi}{2}\right)\cos(10\pi x)$ where x and y are in meter and t is in second`

A. The wavelenghts of wave is $0.2m$

B. An antinode occurs at $x = 0.3m$

C. The speed of the wave is $5.0m / s$

D. A displacement node occurs at $x = 0.4m$

Answer: D

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Multiple Choice Questions Standard Level

1. If the tension in a string in increases from T to 4, T, by keeping other factors constant, then the frequency of the string will

A. be halved

B. be doubled

C. become four times

D. will not change

Answer: B

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2. If the lenghts and diameter of a wire decreased, then for the same the natural frequency of the stretched wire

A. will decrease

B. will increase

C. will not change

D. may increase or decrease

Answer: B

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3. A sonometer wire is emitting a note a frequency n, when stretched by a weigth. If the weigth is completely immersed in water, then the frequency of the wire

A. will be zero

B. will not change

C. will decrease

D. will increases

Answer: C

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4. When a sonometer wire vibrates in the second overtone, there are

A. three nodes and three antinodes

B. four nodes and three antinodes

C. one node and two antinodes

D. two nodes and three antinodes

Answer: B

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5. A stretched string is in resonance with a tuning fork of frequency 250 Hz. If the distance between two consecutive antinodes on the string is 5, then the velocity of the progressive wave in the string is

A. $10m/s$

B. $15m/s$

C. $20m/s$

D. $25m/s$

Answer: D

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6. A sonometer wire is in tnison with a tuning fork of frequency 256 Hz, when the lenghts of the wire between the bridges is 75 cm and only one loop is formed. By keeping the lengths and tension constant, the wire is made to vibrate with 2 loops. The wire can still be in resonance with a tuning fork, provided the freqency of the tuning fork is

A. 100 Hz

B. 512 Hz

C. 384 Hz

D. 128 Hz

Answer: B

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7. A stretched sonometer wire of length 1 meter has a fundamental frequency of 50 Hz. If it is plucked at 25 cm, by keeping the bridge at 50 cm, the frequency of vibration of the string would be,

A. 50 Hz

B. 75 Hz

C. 100 Hz

D. 200 Hz

Answer: C

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8. The fundamental frequency of a wire stretched with a 2 kg wt is 100 Hz. The weigth required to produce its octave will be

A. 4 kg wt

B. 8 kg wt

C. 12 kg wt

D. 16 kg wt

Answer: B

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9. The frequency of the second harmonic emitted by a wire is 200 Hz. The frequency of the third overtone produced by the wire will be

A. 300Hz

B. 400 Hz

C. 500 Hz

D. 600 Hz

Answer: B

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10. Stationary waves are produced in a stretched string of length 120 c. if the string vibrats with 6 segment and if the frquency of vibration of the string is 20 Hz. Then the velocity of waves on the string is

A. $2m / s$

B. $4m / s$

C. $6m / s$

D. $8m / s$

Answer: D

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11. The tension in a piano wire is $10N$. The tension ina piano wire to produce a node of double frequency is

A. 20 N

B. 30N

C. 40 N

D. 80 N

Answer: C

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12. At what tension a wire of length 75 cm and linear density $8 \times 10^{-3} kg/m$, will be resonance with a frequency of 100 Hz.

A. 45 N

B. 90 N

C. 180 N

D. 300 N

Answer: C

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13. A sonometer wire of length 0.7 m is stretch by a weight of 4 kg. what is the linear density of the material of the wire, if its fundamental frequency is 200 Hz?

A. $5 \times 10^{-3} kg/m$

B. $5 \times 10^{-4} kg/m$

C. $8 \times 10^{-4} kg/m$

D. $8 \times 10^{-3} kg/m$

Answer: B

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14. If we want to increases the frequency of transverse oscillations of stretched string by 50%, the tenstion must be increases by

A. $100\ \%$

B. $125\ \%$

C. $150\ \%$

D. $50\ \%$

Answer: B

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15. The length of sonometer wire is doubled and the tension is increases four times. The frequency will

A. become twice

B. be reduced to one half

C. remain the same

D. become on third

Answer: C

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16. A string of linear density $10^{-3}kg/m$ and length 0.5 m is under the tention of 19.6 N. What is the frequency of its fundamental note ?

A. 70 Hz

B. 140 Hz

C. 100 Hz

D. 280 Hz

Answer: B

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17. What is the velocity of a transverse wave along a string of linear density $3.6 \times 10^{-3} kg/m$, when it is under a tention of 1.8 kg wt ? $\left(g = 9.8 m/s^2\right)$

A. $35 m/s$

B. $50 m/s$

C. $70 m/s$

D. $100 m/s$

Answer: C

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18. A stretched string resonates with a tuning fork of frequency 500 Hz, when the length of the string is 0.75 m. If a tuning fork of

frquency 250 Hz is used, then the new resonating length will be

A. $1.5m$

B. $1m$

C. $0.75m$

D. $3m$

Answer: A

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19. The frequency of transverse vibration on a stretched string is 150 Hz. If the tension is increases four times and length is reduced to one fourth of its original value, the frequency of vibration will be

A. 75 Hz

B. 300 Hz

C. 1200 Hz

D. 1800 Hz

Answer: C

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20. A sonometer wire of length l_1 is in reasonance with a frequency 250 Hz. If the length of wire is increasesed then 2 beats per second are heard. What is ratio of the lengths of the wire ?

A. $250:313$

B. $5:3$

C. $125:124$

D. $41:57$

Answer: C

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21. In a stretched wire under tension and fixed at both ends, the area of cross section of the wire is halved and the tension is doubled. The frequency of the wire will be

A. twice

B. half

C. three tiems

D. 3 times

Answer: A

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22. A string of length L fixed at both ends vibrates in its first overtone. Then the wavelength will be

A. $\frac{L}{4}$

B. $\frac{L}{2}$

C. L

D. 2L

Answer: C

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23. An addition load of 6 kg on a string makes its pitch double the fundamental. What was the initial tension in the string ?

A. 1 kg

B. 2 kg

C. 3 kg

D. 4 kg

Answer: B

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24. The velocity of waves in a string fixed at both ends is 3 m/s. The string forms standing waves with nodes 6 cm apart. The frequency of vibration of the string is

A. 25 Hz

B. 50 Hz

C. 15 Hz

D. 10 Hz

Answer: A

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25. A stretched string of length l, fixed at both ends can sustain stationary waves of wavelength λ given by

A. $\lambda = \frac{n^2}{2L}$

B. $\lambda = \frac{n^2}{2n}$

C. $\lambda = \frac{2L}{n}$

D. $\lambda = \frac{2n}{L}$

Answer: C

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26. A stretched string resonates with a tuning fork of frequency 480 Hz, when the length of the string is 60 cm. The length of the same string required to vibrate resonantly with a tuning fork of frequency 240 Hz will be

A. 100 cm

B. 120 cm

C. 130 cm

D. 150 cm

Answer: B

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27. A sonometer wire with a suspended of M=2 kg is in resonance with a tunig fork. The apparatus is taken to the moon where the acceleration due to gravity is $1/6th$ that on the earth. To obtain resonance on the moon, the value of M should be

A. 2 kg

B. 6kg

C. 12 kg

D. 36 kg

Answer: C

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28. Three wires of identical lengths. Diameters and material are streched on a sonometer box. If their tensions are in the ratio of $1:9:16$. Then their fundamental frequency will be

A. $4:3:2$

B. $1:3:4$

C. $1:9:16$

D. $4:3:1$

Answer: B

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29. A transvers disturbance is sent along a sonometer wire of length 1m, and linear density of 0.25 gram/ metre, streteched with a tension

of 10 N. What is the time taken by the transverse disturbance to travel along the wire ?

A. $\frac{1}{200}s$

B. $\frac{1}{100}s$

C. $\frac{1}{300}s$

D. $\frac{3}{100}s$

Answer: A

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30. A stretched wire of length 30 cm emits a note of freqency 200 Hz, when plucked at its centre, By keeping its tension constant, the length of the wire is decreases by 5 cm. then it will a sound note of frequency ?

A. 160 Hz

B. 180 Hz

C. 210 Hz

D. 240 Hz

Answer: D

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31. A vibrating string fork and a vibrating sonometer wire of length 30 cm produce 4 beats/ sec. if the length of the wire is increases to 32 cm, again 4 beats/ sec. heard, what is the frequency of the tuning fork ?

A. 94 Hz

B. 110 Hz

C. 124 Hz

D. 150 Hz

Answer: C

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32. A string of length 2 m is fixed at both ends. If this string vibrates in its fourth normal mode with a frequency of 500 Hz then the waves wouldf travel on it is with a velocity of

A. 250 m/s

B. 500 m/s

C. 750 m/s

D. 125 m/s

Answer: B

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33. A tuning fork of frequency 500 Hz produces 8 beats/ second when sounded with a having sonometer wire. What must be the frequency of the sonometer wire, if a slight increases be the frequency of the sonometer wire,if a slight increases in its tension produces fewer beats per second that before ?

A. a. 508 Hz

B. b. 492 Hz

C. c. 500 Hz

D. d. 504 Hz

Answer: B

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34. A sonometer wire stretched by a tension of $1.5kg$ weigth, has the fundamental frequency of 256 Hz. How much addition weigth should

be placed on the hanger. In order to produce its octave ?

A. $1.5kgwt.$

B. $3kgwt.$

C. $4.5kgwt.$

D. $6kgwt.$

Answer: C

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35. The vibration of a stretched string consists of

A. only the fundamental frequency (n)

B. frequency n, $2n$, $3n$, $4n$, ...

C. frequency n, $3n$, $5n$, ...

D. frequency of n, $2n$, $4n$, $6n$...

Answer: B

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36. The velocity of propagation of transverse waves on a stretched wire will be doubled if (keeping all other factors the same),

A. the radius of the wire is doubled

B. the density of the material of the wire is halved

C. the radius of the wire is halved

D. the density of the wire is doubled

Answer: C

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37. A tuning fork produces 5 beats s^{-1} with a sonometer wire of length 78 cm. If the length of the wire iscreased byy 2 cm, then there is a resonance between the tuning fork and the wire. The frequency of the fork is

A. 195 Hz

B. 190 Hz

C. 200 Hz

D. 180 Hz

Answer: A

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38. A weight of 5 kg is required to produce the fundamental frequency of a sonometer wire. What weight is requried to produce

its octave ?

A. 10 kg wt

B. 20 kg wt

C. 30 kg wt

D. 40 kg wt

Answer: B

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39. A vibrating sonometer wire in resonance with a tuning fork of frequency 150 Hz. If only loop is formed on the wire and the length of one loop is 40 cm, then the velocity of transverse waves on the wire will be

A. a. $120m / s$

B. b. $240m / s$

C. c. $90m / s$

D. d. $60m / s$

Answer: A

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40. What is the velocity of a transverse wave travelling along a thin copper wire of length 50 cm and mass 1 gram, if it is stretched by a weigth of 4 kg ?

A. $60m / s$

B. $90m / s$

C. $110m / s$

D. $140m / s$

Answer: D

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41. A stretched wire of length 1 m and weighing 1 gram is in unison with a tuning fork of frequency 200 Hz. The tension in the wire will be

A. 160 N

B. 80 N

C. 320 N

D. 200 N

Answer: A

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42. Standing wavs are produced in a stretched string of length 8 m. If the string vibrates in 4 loops and the wave velocity is 20 m/s, then the frequency of the string will be

A. 2 Hz

B. 5 Hz

C. 7.5 Hz

D. 10 Hz

Answer: B

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43. A string is stretched betweeb fixed points separated by $75.0cm$. It observed to have resonant frequencies of $420Hz$ and $315Hz$. There are no other resonant frequencies between these two. The lowest resonant frequency for this strings is

A. 55 Hz

B. 105 Hz

C. 155 Hz

D. 210 H z

Answer: B

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44. If a string fixed at both ends, vibrates in its fourth harmonic, the wavelength is 15 cm. What is the length of the string ?

A. 20 c m

B. 30cm

C. 25 cm

D. 40 cm

Answer: B

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45. If the sonometer experiment is performed in a lift and if the lift starts falling down freely, then the fundamental frequency of the sonometer wire will

A. be very high

B. be very low

C. be zero

D. remain the same

Answer: C

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46. If the vibrating length of a string is increased by 25%, then its fundamental frequency will

A. increase by 25%

B. decrease by 25%

C. decrease by $20\ \%$

D. decrease by $25\ \%$

Answer: C

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47. The length of a sonometer wire between two fixed ends is 110cm. Where should the two bridges the placed so as to divide the wire into three segments, whose fundamental frequencies are in the ration$1:2:3$?

A. $60cm, 90cm$

B. $30cm, 90cm$

C. $40cm, 70cm$

D. $20cm, 60cm$

Answer: A

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48. Two wires of the same material and same cross sectional area are vibrating with the same frequency. The first wire of length 80 cm is loaded with 8 kg and the second wire is loaded with 2 kg. The length of the second wire is

A. $40cm$

B. $80cm$

C. $70cm$

D. $60cm$

Answer: A

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49. The fundamental frequency of a sonometer wire is 100 Hz. If a weigth of 3 kg is added to the hanger, the frequency of the wire is doubled. What was the initial load on the hanger ? [The weight of the hanger is included in the load .]

A. 0.5 kg wt

B. 2 kg wt

C. 3 kg wt

D. 1 kg wt

Answer: D

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50. A string of length L between the two bridges of sonometer wire vibrates in the second harmonic. Its amplitude of vibration is maximum at

A. $\frac{L}{2}$

B. $\frac{L}{6}, \frac{5L}{6}$

C. $\frac{L}{4}$ and $\frac{3L}{4}$

D. $\frac{L}{3}$ and $\frac{2L}{3}$

Answer: C

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51. A tuning fork of frequency 400 Hz, produces 10 beats/ sec, when sounded with a vibrating sonometer string . What must have been the frequency of the string if a slight increase in tension in the string , produces fewer beats per second than before ?

A. 390 Hz

B. 410 Hz

C. 415 Hz

D. 420 Hz

Answer: A

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52. A pulse of a wave train travels along a stretched string and reaches the fixed end of the string.it will be reflected back with

A. a phase change of 180° with velocity reversed

B. the same phase as the incident pulse with no reversal of velocity

C. a phase change of 180° with no reversal of velocity

D. the same phase as the incident pulse but with velocity reversed

Answer: C

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53. If you set up the seventh harmonic on a string fixed at both ends, how many nodes and antinodes are set up in it -

A. $7, 7$

B. $7, 8$

C. $8, 7$

D. $9, 8$

Answer: C

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54. The fundamental frequency of a sonometer wire is 200 Hz. It is found that a tuning fork of frequency 400 Hz produces resonant vibrations in the same wire . Then the wire vibrates with

A. one loop

B. two loops

C. three loops

D. four loops

Answer: B

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55. A sonometer wire is in unison with a tuning fork . When its length increases by 4% , it gives 8 beats/with the same fork. What is the frequency of the fork ?

A. 196 Hz

B. 200 Hz

C. 204 Hz

D. 208 Hz

Answer: D

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56. A string is kept stretched under a tension T, the velocity of transverse wave travelling along the string is

A. $\propto T$

B. $\propto \sqrt{T}$

C. $\propto T^2$

D. $\propto T^{-1}$

Answer: B

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57. A stretched string is vibrating in the second overtone, then the number of nodes and anti-nodes between the ends of the string are respectivley

A. $3, 4$

B. $4, 3$

C. $2, 3$

D. $3, 3$

Answer: B

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58. Stationary waves are produced in 10 m long stretched string. If the string vibrates in 5 segments and wave velocity 20 m/s then the frequency is :-

A. 2 Hz

B. 4 Hz

C. 5 Hz

D. 10 Hz

Answer: C

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59. A tuning fork produces 4 beats /sec, with a sonometer wire of length 40 cm. It is found that when the length is increased to 44 cm, by keeping other factors constant, again 4 beats/sec are produced. What is the frequency of the tuning fork ?

A. 44 Hz

B. 84 Hz

C. 100 Hz

D. 176 Hz

Answer: B

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60. A sonometer wire is resonating with a tuning fork of frequency N. If its length is increased by 10% , by keeping the tension constant , 6 beats are heard per second, then

A. $N = 60$ Hz

B. $N = 66$ Hz

C. $N = 54$ Hz

D. $N = 72$ H z

Answer: B

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61. A wire of mass 5 gram is kept stretched by a force of 400 N. When plucked at a point, transverse waves travel along the wire with a speed of 400 m/s. The length of the wire is

A. 1 m

B. 2 m

C. 3 m

D. 1.5 m

Answer: B

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62. If the weight attached to the sonometer wire is increased from 2 kg wt to 8 kg wt, the ratio of the number of antinodes observed in the second and first case will be

A. $1:1$

B. $1:2$

C. $2:1$

D. $3:2$

Answer: C

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63. Two travelling waves $y_1 = A\sin[k(x-ct)]$ and $y_2 = A\sin[k(x+ct)]$ are superimposed on string. The distance between adjacent nodes is

A. $\frac{\pi}{k}$

B. $\frac{ct}{\pi}$

C. $\frac{ct}{2\pi}$

D. $\frac{\pi}{2k}$

Answer: A

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64. The length and diameter of a metal wire is doubled the fundamental frequency of vibration will change from n to (tension being kept constant and material of both the wires is same)

A. $\frac{n}{4}$

B. $\frac{n}{8}$

C. $\frac{n}{12}$

D. $\frac{n}{16}$

Answer: A

Watch Video Solution

65. Standing waves are produced on a string of length 2 m and of linear mass density 4×10^{-2} kg/m . What is the frequency of the harmonic as shown in the figure, if the applied tension is 100 N ?

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A. 25 Hz

B. 50 Hz

C. 37.5 Hz

D. 12.5 Hz

Answer: C

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Multiple Choice Questions Higher Level

1. A tuning fork produces 4 beats /sec, with a sonometer wire of length 40 cm. It is found that when the length is increased to 44 cm, by keeping other factors constant, again 4 beats/sec are produced. What is the frequency of the tuning fork ?

A. 44 Hz

B. 84 Hz

C. 100 Hz

D. 176 Hz

Answer: B

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2. A second harmonic has to be generated in a string of length l stretched between two rigid supports. The point where the string has to be plucked and touched are

A. pluck at $\frac{L}{2}$ and touch at $\frac{3L}{4}$

B. pluck at $\frac{L}{4}$ and touch at $\frac{L}{2}$

C. pluck at $\frac{L}{3}$ and touch at $\frac{L}{2}$

D. pluck at $\frac{L}{4}$ and touch at $\frac{L}{3}$

Answer: B

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3. The length of a sonometer wire is 1m. Where should be the bridge placed to divide the wire into 2 segments, whose fundamental frequencies are in the ratio $1:2$?

A. At $\frac{1}{3}$ m from the left end

B. At $\frac{2}{3}$ m from the left end

C. At the centre

D. At 80 cm from the left end

Answer: B

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4. If the tension and diameter of a sonometer wire of fundamental frequency n are doubled and density is halved then its fundamental frequency will become

A. 2n

B. n

C. $\frac{n}{\sqrt{2}}$

D. $3n$

Answer: B

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5. A string oscillating at fundamental frequency under a tension of 225 N produces 6 beats/sec with a fork . If the tension is increased to 256 N, then again oscilaating at its fundamental note it produces 6 beats/sec, with the same fork . What is the frequency of the tuning fork ?

A. 186 Hz

B. 225 Hz

C. 250 Hz

D. 300 Hz

Answer: A

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6. The length of a string tied between two rigid supports is 50 cm. The maximum wavelength of a stationary wave produced on it is

A. 25 cm

B. 75 cm

C. 100 cm

D. 125 cm

Answer: C

Watch Video Solution

7. The successive resonating frequencies for a stretched wire are 250 Hz and 300 Hz. The wire is stretched between two rigid supports with a tension of 36 N.

If the mass per unit length of the wire is 0.01 kg, then the length of the wire is

A. 40 cm

B. 50 cm

C. 60 cm

D. 70 cm

Answer: C

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8. A stretched string of length L fixed at both the ends has nodes, where $n > 2$. What is the length of the string in terms of n and λ ?

A. $L = \frac{n\lambda}{2}$

B. $L = n\lambda$

C. $L = (n+1)\frac{\lambda}{2}$

D. $L = (n-1)\frac{\lambda}{2}$

Answer: D

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9. A transverse wave described by $y = 0.5\sin(x + 40t)$ is propagating on a vibrating string of linear density 0.01 kg/m. If x and y are in metre and time is in second, then the tension in the wire is

A. 4 N

B. 8 N

C. 16 N

D. 32 N

Answer: C

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10. A tuning fork of known frequency $256Hz$ makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string

is slightly increased. The frequency of the piano string before increasing the tension was

A. $(256 + 5)$ Hz

B. $(256 - 5)$ Hz

C. $(256 - 2)$ Hz

D. $(256 + 2)$ Hz

Answer: B

Watch Video Solution

11. A string of mass 0.250 kg is under a tension of 2 N. The length of the stretched string is 2 m. A transverse wave disturbance starts at one end of the string . How long will the disturbance take to reach the other end ?

A. $1, 5$ s

B. 1.5 s

C. 1 s

D. 0.5 s

Answer: D

Watch Video Solution

12. A tuning fork when vibrating along with a sonometer produces 6 beats per second when the length of the wire is either 20 cm or 21 cm . Find the frequency of the tuning fork.

A. 226 Hz

B. 246 Hz

C. 236 Hz

D. 256 Hz

Answer: B

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13. The fundamental frequency of a sonometer wire is 100 Hz for a certain length and tension. If only the length of the wire is increased by 25% , when will be the percentage change in the frequencies of second harmonics in the first and second case ?

A. Increase by 30%

B. Decrease by 30%

C. Decrease by 20 %

D. Increase by 20%

Answer: C

Watch Video Solution

14. A string is stretched betweeb fixed points separated by $75.0cm$. It observed to have resonant frequencies of $420Hz$ and $315Hz$. There are no other resonant frequencies between these two. The lowest resonant frequency for this strings is

A. 1050 Hz

B. 10.5 Hz

C. 105 Hz

D. 1.05 Hz

Answer: C

Watch Video Solution

15. A wire of density $9 \times 10^3 kg/m^3$ is stretched between two clamps 1 m apart and is subjected to an extension of $4.9 \times 10^{-4} m$. The

lowest frequency of transverse vibration in the wire is $\left(Y = 9 \times 10^{10} N/m^2\right)$

A. 105 Hz

B. 70 Hz

C. 35 Hz

D. 15 Hz

Answer: C

Watch Video Solution

16. A stretched string of length $1m$ fixed at both ends , having a mass of $5 \times 10^{-4} kg$ is under a tension of $20N$. It is plucked at a point situated at $25cm$ from one end . The stretched string would vibrate with a frequency of

A. 100 Hz

B. 150 Hz

C. 200 Hz

D. 250 Hz

Answer: C

Watch Video Solution

17. A metal wire of linear mass density of $9.8g/m$ is stretched with a tension of $10kg - wt$ between two rigid support $1meter$ apart. The wire passes at its middle point between the poles of a permanent magnet, and it vibrates in resonance when carrying an alternating current of frequency n. the frequency n of the alternating source is

A. 100 Hz

B. 50 Hz

C. 25 Hz

D. 200 Hz

Answer: B

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18. Beats are heard when the A strings of two violins X and Y are played . If the tension in the A string of X is slowly increased, the beat frequency is decreased. This suggests that

A. the fundamental frequency of the A string in X is less than that for Y

B. the fundamental frequency of the A string in Y is more than that for Y

C. the fundamental frequency of the A string of X may be more or less than that of Y, depending upon the linear mass densities of X and Y

D. the fundamental frequency of the A string of X may be more or less than that of Y depending on the temperature

Answer: A

Watch Video Solution

19. Two wires are producing fundamental notes of the same frequency. Change in which of the following factors of one wire will not produce beats between them

A. Material of the wire

B. Stretching force (weight attached to the wire)

C. Amplitude of vibrations

D. Diameter of the wire

Answer: C

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20. At the poles, a stretched wire of a certain length vibrates in unison with a tuning fork of given frequency. Then at the equator, for the same setting, for producing resonance with the same tuning fork, the vibrating length of the wire

A. should be increased

B. should be decreased

C. should not be changed

D. should be doubled

Answer: B

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21. The tension of a stretched string is increased by 69%. In order to keep its frequency of vibration constant, its length must be increased by :

A. $40\ \%$

B. $30\ \%$

C. $20\ \%$

D. $10\ \%$

Answer: B

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22. The equation of a wave on a string of linear mass density $0.04 kgm^{-1}$ is given by $y = 0.02(m)\sin\left[2\pi\left(\frac{t}{0.04(s)} - \frac{x}{0.50(m)}\right)\right]$. The tension in the string is :

A. 6.25 N

B. 4.0 N

C. 12.5 N

D. 0.5 N

Answer: A

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23. 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 string vibrate in their fundamental nodes, the one of length L with freuqency v_1 and the other with frequency v_2. the ratio v_1 / v_2 is given by

A. 8

B. 4

C. 2

D. 1

Answer: D

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24. The equation for the vibration of a string fixed at both ends vibrating in its third harmonic is given by $y = 2cm \sin\left[\left(0.6cm^{-1}\right)x\right]\cos\left[\left(500\pi s^{-1}\right)t\right]$. The length of the string is

A. 15.7 cm

B. 20.6 cm

C. 24.6 cm

D. 12.5 cm

Answer: A

Watch Video Solution

25. A $20cm$ long string, having a mass of $1.0g$, is fixed at both the ends. The tension in the string is $0.5N$. The string is into vibrations using an external vibrator of frequency $100Hz$. Find the separation (in cm) between the successive nodes on the string.

A. 22 cm

B. 5 cm

C. 15 cm

D. 25 cm

Answer: B

Watch Video Solution

26. The extension in a string, obeying Hooke's law, is x. The speed of sound in the stretched string is v. If the extension in the string is increased to $1.5x$, the speed of sound will be :-

A. 1.50 v

B. 0.75 v

C. 0.61 v

D. 1.22 v

Answer: D

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27. A sonometer wire resonates with a given tuning fork forming a standing wave with five antinodes between the two bridges when a mass of $9kg$ is suspended from the wire. When this mass is replaced by a mass 'M' kg, the wire resonates with the same tuning fork

forming three antinodes for the same positions of the bridges. Find the value of M.

A. 12.5 kg

B. $(1/25)$ kg

C. 5 kg

D. 25 kg

Answer: D

Watch Video Solution

28. A vibrating string of certain length l under a tension T resonates with a mode corresponding to the first overtone (third harmonic) of an air column of length $75cm$ inside a tube closed at one end. The string also generates 4 beats per second when excited along with a tuning fork of frequency n. Now when the tension of the string is slightly increased the number of beats reduces 2 per second.

Assuming the velocity of sound in air to be $340m/s$, the frequency n of the tuning fork in Hz is

A. 120 Hz

B. 336 Hz

C. 240 Hz

D. 344 Hz

Answer: D

Watch Video Solution

29. The vibrations of a string of length $600cm$ fixed at both ends are represented by the equation $y = 4\sin\left(\pi\frac{x}{15}\right)\cos(96\pi t)$ where x and y are in cm and t in seconds.

A. Fundamental

B. Third

C. Fourth

D. Fifth

Answer: C

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30. A hollow pipe of length $0.8m$ is closed at one end. At its open end a $0.5m$ long uniform string is vibrating in its second harmonic and it resonates with the fundamental frequency of the pipe. If the tension in the wire is $50N$ and the speed of sound is $320ms^{-1}$, the mass of the string is

A. 5 gram

B. 10 gram

C. 20 gram

D. 40 gram

Answer: B

Watch Video Solution

31. 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 $y_1 = A\sin(\pi / L)\sin\omega t$ and energy is E_1 and in another experiment its displacement is $y_2 = A\sin(2\pi x / L)\sin 2\omega t$ and energy is E_2. Then

A. $E_2 = E_1$

B. $E_2 = 4E_1$

C. $E_2 = 2E_1$

D. $E_2 = 16E_1$

Answer: B

Watch Video Solution

32. A steel wire of length $1m$, mass $0.1kg$ and uniform cross-sectional area $10^{-6}m^2$ is rigidly fixed at both ends. The temperature of the wire is lowered by $20^{\circ}C$. If transverse waves are set up by plucking the string in the middle.Calculate the frequency of the fundamental mode of vibration.

Given for steel $Y = 2 \times 10^{11} N/m^2$

$\alpha = 1.21 \times 10^{-5} per^{\circ} C$

A. 7 Hz

B. 11 Hz

C. 15 Hz

D. 22 Hz

Answer: B

Watch Video Solution

33. A uniform copper wire of length L , mass M and density ρ is under a tension T . If the speed of the transverse wave along the wire is v, then area of cross section (A) of the wire is

A. $\frac{Tv^2}{\rho}$

B. $\frac{T}{v^2\rho}$

C. $\frac{v^2\rho}{T}$

D. $\frac{T\rho}{v^2}$

Answer: B

Watch Video Solution

34. A sonometer wire of length L_1 and vibrating in its fundamental mode is in unison with a tuning fork of frequency n. When the vibrating length of the same wire is reduced to L_2, it produces x

beats/second with the fork.

What is the frequency of teh fork ?

A. $\frac{L_1}{(L_1 - L_2)}x$

B. $\left(\frac{L_2}{L_1 - L_2}\right)x$

C. $\left(\frac{L_1 - L_2}{L_1 x}\right)$

D. $\left(\frac{L_1 - L_2}{L_2 x}\right)$

Answer: B

Watch Video Solution

35. In a sonometer experiment the bridges are separted by a fixed distance the wire which is slightly elastic emits a tone of frequency n when held by tension T If the tension is increased to 4T the tone emitted by the wire will be of frequency

A. n

B. 2n

C. slightly greater than 2n

D. slightly less than 2n

Answer: D

Watch Video Solution

36. Two Cu wires of radii R_1 and R_2 are such that $(R_1 > R_2)$. Then which of the following is true ?

A. travel faster in the thinner wire

B. travel with the same velocity in both the wires

C. not travel through both the wires

D. travel faster in the thicker wire

Answer: A

Watch Video Solution

37. A tuning fork vibrating with a sonometer having 20 cm wire produces 5 beats per second. The beat frequency does not change if the length of the wire is changed to 21 cm. The frequency of the tuning fork (in Hertz) must be

A. 205

B. 215

C. 210

D. 200

Answer: A

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38. The frequency of a stretched uniform wire under tension is in resonance with the fundamental frequency of a closed tube. If the tension in the wire is increased by 8 N , it is in resonance with the first overtone of the closed tube. The initial tension in the wire is

A. 4 N

B. 8 N

C. 16 N

D. 1 N

Answer: D

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39. Two uniform strings A and B made of steel are made to vibrate under the same tension. If the first overtone of A is equal to the

second overtone of B and if the radius of A is twice that of B, the ratio of the lengths of the strings is

A. $1:4$

B. $1:6$

C. $1:2$

D. $1:3$

Answer: D

Watch Video Solution

40. A stretched wire emits a fundamental note of frequency 256Hz. Keeping the stretching force constant and reducing the length of the wire by 10cm, frequency becomes 320Hz. Calculate original length of the wire.

A. 30 cm

B. 40 cm

C. 50 cm

D. 60 cm

Answer: C

Watch Video Solution

41. The stirng stretched by tension T and length L vibrates in resonance with a tuning fork of frequency n. the tension in the stretched string is increased by 69% and length of string reduced by 35%. Then, the frequency of vibrating string is

A. n

B. 1.5n

C. 2n

D. $n/2$

Answer: C

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42. The frequency of the third overtone of a closed pipe of length L_c is the same as the frequency of the sixth overtone of an open pipe of the length L_o. Then

A. $\frac{L_o}{L_c} = 4$

B. $\frac{L_o}{L_c} = \frac{2}{1}$

C. $\frac{L_o}{L_c} = \frac{1}{4}$

D. $\frac{L_o}{L_c} = \frac{1}{2}$

Answer: B

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43. An open pipe of length L is emitting its fundamental frequency . If one end of the pipe is closed , then the frequency of the first overtone of the closed pipe is found to be higher by 100 Hz than the fundamental frequency of the open pipe. What is the fundamental frequency of the closed pipe ?

A. 100 Hz

B. 150 Hz

C. 200 hz

D. 250 Hz

Answer: A

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44. Tube A has both ends open while tube B has one end closed. Otherwise they are identical. Their

fundamental frequencies are in the ratio

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

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45. The lengths of two organ pipes open at both ends are L and $L+d$. If they are sounde together, then the beat frequency will be

A. $\frac{2Vd}{L(L+x)}$

B. $\frac{Vd}{L(L+d)}$

C. $\frac{2L(L+d)}{Vd}$

D. $\frac{Vd}{2L(L+d)}$

Answer: D

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46. The frequency of sound waves produced by an organ pipe is n , at room temperature . If the temperature is increased by $20^{\circ}C$, then the frequency of sound waves

A. will decrease

B. will increase

C. will remain unchanged

D. will be reduced by $20\ \%$

Answer: B

Watch Video Solution

47. 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 $100Hz$ then the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is

A. 150 Hz

B. 200 Hz

C. 250 Hz

D. 300 Hz

Answer: B

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48. An open organ pipe of length L vibrates in its fundamental mode. The pressure variation is maximum

A. at the two ends

B. at he distance of $\frac{L}{2}$ inside the ends

C. at a distance of $\frac{L}{4}$ inside the ends

D. at a distance of $\frac{L}{8}$ inside the ends

Answer: B

Watch Video Solution

49. In the fundamental mode , time taken by the wave to reach the closed end of the air filled pipe is 0.01 s . The fundamental frequency is

A. 15 Hz

B. 20 Hz

C. 25 Hz

D. 2.5 Hz

Answer: C

Watch Video Solution

50. For a certain pipe, three successive resonant frequencies are observed at 300 Hz, 420 Hz and 540 Hz.

The speed of sound in air is 340 m/s. The pipe is a

A. closed pipe of length $\frac{11}{12}$ m

B. open pipe of length $\frac{11}{12}$ m

C. closed pipe of length $\frac{17}{12}$ m

D. open pipe of length $\frac{17}{12}$ m

Answer: C

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51. An open pipe is in resonance in $2nd$ 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 ocuurs in nth harmonic. Choose the correct option

A. $n = 3, f_2 = \frac{3}{4} f_1$

B. $n3, f_2 = \frac{5}{4} f_1$

C. $n = 5, f_2 = \frac{5}{4} f_1$

D. $n = 5, f_2 = \frac{3}{4} f_1$

Answer: C

Watch Video Solution

52. An open pipe of length 120 cm vibrates in its fundamental mode. At what distance from one end of the pipe, the pressure variation is maximum ?

A. At 30 cm

B. At 60 cm

C. At 90 cm

D. At 120 cm

Answer: B

Watch Video Solution

53. A source of sound placed at the open end of a resonance column sends an acoustic wave of pressure amplitude P_0 inside the tube. If the atmospheric pressure is P_A, then the ratio of maximum and minimum pressure at the closed end of the tube will be

A. $\frac{P_A}{P_O}$

B. $\frac{P_A + P_O}{P_A - P_O}$

C. $\frac{P_A + 2P_O}{P_A - 2P_O}$

D. $\sqrt{\frac{P_A + P_O}{P_A - P_O}}$

Answer: B

Watch Video Solution

54. A steel rod 100 cm long is clamped at its middle. The fundamental frequency of longitudinal vibrations of the rod is given to be 2.53k Hz. What is the speed of sound in steel?

A. 2.5 km/s

B. 4 km/s

C. 5 km/s

D. 6 km/s

Answer: C

Watch Video Solution

55. n_1 is the frequency of the pipe closed at one and n_2 is the frequency of the pipe open at both ends. If both are joined end to end, find the fundamental frequency of closed pipe so formed

A. $\frac{2n_1 - n_2}{n_1 n_2} Hz$

B. $\frac{n_1 n_2}{2n_1 + n_2} Hz$

C. $\frac{n_1 + n_2}{n_1 - n_2} Hz$

D. $\frac{n_1 n_2}{2n_2 + n_1} Hz$

Answer: B

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56. An organ pipe P_1 open at one end vibrating in its first harmonic and another pipe P_2 open at ends vibrating in its third harmonic are

in resonance with a given tuning fork. The ratio of the length of P_1 to that P_2 is

A. $\frac{3}{5}$

B. $\frac{8}{3}$

C. $\frac{1}{6}$

D. $\frac{1}{8}$

Answer: C

Watch Video Solution

57. A cylindrical tube open at both ends, has a fundamental frequency f in air. The tube is dipped vertically in air. The tube is dipped vertically in water so that half of it is in water. The fundamental frequency of the air column is now

A. $\frac{f}{2}$

B. $\frac{3f}{4}$

C. $2f$

D. f

Answer: D

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58. An open pipe is in resonance in $2nd$ 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 ocuurs in nth harmonic. Choose the correct option

A. $n = 3, f_2 = \frac{5}{4} f_1$

B. $n = 3, f_2 = \frac{3}{4} f_1$

C. $n = 5, f_2 = \frac{3}{4} f_1$

D. $n = 5, f_2 = \frac{5}{4} f_1$

Answer: C

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59. Two organ pipes having the same internal diameter (d) but of different lengths l_1 and l_2 are closed at one end. If they are vibrating at their fundamental frequencies, then the end correction at end is given by

A. $\frac{n_1 l_1 - n_2 l_2}{n_2 - n_1}$

B. $\frac{n_2 l_2 - n_1 l_1}{n_2 - n_2}$

C. $\frac{n_2 - n_1}{n_1 l_1 - n_2 l_2}$

D. $\frac{n_1 l_2 - n_2 l_1}{n_1 - n_2}$

Answer: A

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60. The p^{th} overtone of an organ pipe open at both ends has a frequency n_1 . What one end of the pipe is closed , its q^{th} overtone has a frequency n_2. What is the value of $\frac{n_1}{n_2}$?

A. $\frac{2q+1}{2(p+1)}$

B. $\frac{p+1}{2(2q+1)}$

C. $\frac{2(p+1)}{2q+1}$

D. $\frac{2(2q+1)}{p+1}$

Answer: C

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61. In a pipe opened at both ends n_1 and n_2 be the frequencies corresponding to vibrating lengths L_1 and L_2 respectively .The end correction is

A. $\frac{n_1 l_1 - n_2 l_2}{2(n_1 - n_2)}$

B. $\frac{n_2 l_2 - n_1 l_1}{2(n_2 - n_1)}$

C. $\frac{n_2 l_2 - n_1 l_1}{2(n_1 - n_2)}$

D. $\frac{n_1 l_1 - n_2 l_2}{(n_1 - n_2)}$

Answer: C

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62. Two open organ pipes of lengths 25 cm and 25.5 produce 10 beats/sec. What is the velocity of sound ?

A. 200 m/s

B. 205 m/s

C. 255 m/s

D. 250 m/s

Answer: C

Watch Video Solution

63. The fundamental of a closed pipe is 220 Hz. If $\frac{1}{4}$ of the pipe is filled with water, the frequency of the first overtone of the pipe now is

A. 880 Hz

B. 1760 Hz

C. 220 Hz

D. 440 Hz

Answer: A

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64. A forced oscillator is acted upon by a force, $F = F_0 \sin \omega t$. The amplitude of the oscillator is given by $A = \frac{55}{\sqrt{(2\omega^2 - 36\omega + 9)}}$

What is the resonance angular freuqnecy (in rad/s)?

A. 36

B. 18

C. 9

D. 2

Answer: C

Watch Video Solution

65. In forced oscillation of a particle the amplitude is maximum for a frequency ω_2 of the force while the energy is maximum for a frequecyomega_(2) of the force, then .

A. $\omega_1 < \omega_2$

B. $\omega_1 < \omega_2$ when damping is small and $\omega_1 > \omega_2$ when damping is large

C. $\omega_1 > \omega_2$

D. $\omega_1 = \omega_2$

Answer: D

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66. In Melde's experiment in parallel position the mass of the pan is M_0. When a mass m_1 is kept in the pan, the number of loops formed is p_1. For the mass m_2, the number of loops, formed is p_2. Then the mass of the pan M_0, in terms of m_1, m_2, p_1 and p_2 is given by

A. $M_0 = \dfrac{p_1^2 - p_2^2}{m_2 p_2^2 - m_1 p_1^2}$

B. $M_0 = \dfrac{m_2 p_2^2 - m_1 p_1^2}{p_1^2 - p_2^2}$

C. $M_0 = \frac{m_2 p_2^2 + m_1 p_1^2}{p_1^2 - p_2^2}$

D. $M_0 = \frac{m_2 p_2^2 - m_1 p_1^2}{p_1^2 + p_2^2}$

Answer: B

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67. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of the air column that resonates in the fundamental mode, with a tuning fork is $0.1m$. When this length is changed to $0.35m$, the same tuning fork resonates with the first overtone. Calculate the end correction.

A. 1.25 cm

B. 2.5 cm

C. 3.75 cm

D. 5 cm

Answer: B

Watch Video Solution

68. A tuning fork of frequency 340 Hz is kept vibrating above a measuring cylinder of height 100 cm. Water is slowly poured in the cylinder . What is the minimum height of water in the tube for which resonance will be obtained ?

(Speed of sound in air = 340 m/s)

A. 25 cm

B. 40 cm

C. 50 cm

D. 60 cm

Answer: A

Watch Video Solution

69. It is desired to increase the fundamental resonance frequency in a tube which is closed at one end. This can be achieved by

A. Increasing the length of the tube

B. Decreasing the length of the tube

C. Replacing the air in the tube by hydrogen gas

D. Opening the closed end of the tube

Answer: A

Watch Video Solution

70. A student performed the resonance tube experiment by using a tuning fork of frequency 512 Hz. He obtained the first and second resonances at 30.7 cm and 63.2 cm respectively . What was the error

in the measurement of the velocity of sound, if the actual speed of sound at the temperature of the experiment was 330 m/s ?

A. 80 cm/s

B. 140 cm/s

C. 180 cm/s

D. 280 cm/s

Answer: D

Watch Video Solution

71. While measuring the speed of sound by performing a resonance column experiment, a student gets the first resonance condition at a column length of $18cm$ during winter. Repeating the same experiment during summer, she measures the column length to be xcm for the second resonance. Then

A. $36cm > x > 18cm$

B. $x > 54$ cm

C. $18cm > x$

D. $54cm > x > 36$ cm

Answer: B

Watch Video Solution

72. An air column in a resonace tube of length 1.5 m resonates with a source of frequency 125 Hz, when the water level in it at a certain height from the bottom of the tube. What is the height of water level corresponding to the fundamental frequency ?

(Neglect the end correction and speed of sound in air is 330 m/s)`

A. 1.2 m

B. 0.5 m

C. 0.84 m

D. 0.42 m

Answer: C

Watch Video Solution

73. An air column in a pipe of length 1 m and closed at one end, will be in resonace with a vibrating tuning fork of frequency 250 Hz, if the length of the column is

[v = 330 m/s]

A. $33cm, 66cm$

B. $33cm, 99cm$

C. $16.5cm, 33cm$

D. $33cm, 132cm$

Answer: B

Watch Video Solution

74. An air column in a pipe, which is closed at one end will be in resonace with a vibrating tuning fork of frequency 264 Hz for various lengths. Which one of the following lengths is not possible ? [v = 330 m/s]

A. 93.75 cm

B. 156.25 cm

C. 62.50 cm

D. 31.25 cm

Answer: C

Watch Video Solution

75. A student is performing the experiment of resonance column. The diameter of the column tube is $4cm$. The frequency of the tuning fork is $512Hz$. The air tempreture is $38 \circ C$ in which the speed of sound is $336m/s$. The zero of the meter scale coincide with the top end of the resonance column tube. when the first resonance ocuurs, the reading of the water level in the column is

A. 14.0 cm

B. 15.2 cm

C. 16.4 cm

D. 17.6 cm

Answer: B

Watch Video Solution

Multiple Choice Questions Standard Level

1. If the velocity of sound in air is 350 m/s . Then the fundamental frequency of an open organ pipe of length 50 cm, will be

A. 150 Hz

B. 175 Hz

C. 350 Hz

D. 700 Hz

Answer: C

Watch Video Solution

2. If v is the speed of sound in air then the shortest length of the closed pipe which resonates to a frequency n

A. $\frac{V}{2n}$

B. $\frac{4n}{V}$

C. $\frac{V}{4n}$

D. $4Vn$

Answer: C

Watch Video Solution

3. The frequency of the fundamental note produced by a pipe closed at one end is 100 Hz. Which one of the following frequencies will not be emitted by the pipe ?

A. 100 Hz

B. 200 Hz

C. 300 Hz

D. 500 Hz

Answer: B

Watch Video Solution

4. Two consecutive harmonics of an air column in a pipe closed at one end are of frequencies 150 Hz and 250 Hz.

What is the fundamental frequency ?

A. 50 Hz

B. 100 Hz

C. 75 Hz

D. 25 Hz

Answer: A

Watch Video Solution

5. If the length of a closed organ pipe is 1m and velocity of sound is 330 m/s , then the frequency for the second note is

A. $2 \times \frac{330}{4} Hz$

B. $2 \times \frac{4}{330} Hz$

C. $3 \times \frac{330}{4} Hz$

D. $4 \times \frac{330}{4}$ Hz

Answer: C

Watch Video Solution

6. Two closed pipe produce 10 beats per second when emitting their fundamental nodes. If their length are in ratio of 25 : 26. Then their fundamental frequency in Hz , are

A. $260, 270$

B. $260, 250$

C. $260, 280$

D. $270, 280$

Answer: B

Watch Video Solution

7. If the velocity of sound in air at $30^\circ C$ is 330 m/s. Then the fundamental frequency of a pipe of length 82.5 cm is

A. a. 100 Hz

B. b. 200 Hz

C. c. 150 Hz

D. d. 50 Hz

Answer: B

Watch Video Solution

8. The air in a pipe closed at one end is in resonance with a vibrating tuning fork of frequency 170 Hz. If the velocity of sound in air is 340 m/s, the length of the vibrating air column is

A. 100 cm

B. 50 cm

C. 300 cm

D. 25 cm

Answer: B

Watch Video Solution

9. A tube closed at one end produces a fundamnetal note of frequency 480 Hz. If the same tube is kept open at both the ends, the fundamental frequency that can be excited is

A. 240 Hz

B. 120 Hz

C. 960 Hz

D. 720 Hz

Answer: C

Watch Video Solution

10. A pipe closed at one end open at the other end, resonates with sound waves of frequency 135 Hz and also 165 Hz, but not with any wave of frequency intermediate between these two. Then, the frequency of the fundamental note is

A. 7.5 Hz

B. 15 Hz

C. 30 Hz

D. 60 Hz

Answer: B

Watch Video Solution

11. The fundamental frequency of a pipe closed at one end is 20 Hz. What is the ratio of the frequencies of the third and fifth overtones ?

A. $3:5$

B. $7:11$

C. $11:7$

D. $5:3$

Answer: B

Watch Video Solution

12. For a certain organ pipe, three successive resonance frequencies are observed at 400 Hz, 560 Hz and 720 Hz.

The fundamental frequency of the pipe is

A. 60 Hz

B. 70 Hz

C. 80 Hz

D. 90 Hz

Answer: C

Watch Video Solution

13. The ratio of fundamental frequencies of an open organ pipe and a cloed organ pipe of same length at same temperature is

A. $1:2$

B. $2:1$

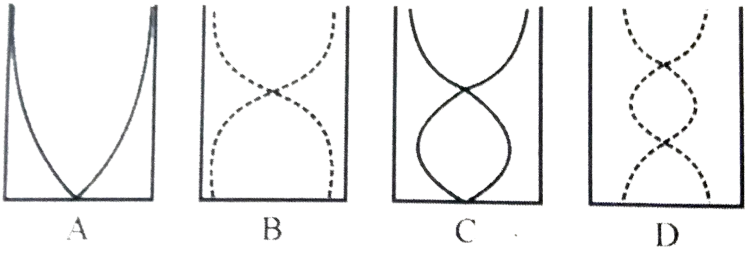
C. $3:1$

D. $1:3$

Answer: A

Watch Video Solution

14. If the vibrations of four air columns are as shown in the figures A , B, C , D then the ratio of their frequencies $i.\ e.\ N_A:N_B:N_C:N_D$ is



A. $1:2:4:3$

B. $1:2:3:4$

C. $4:3:2:1$

D. $10:5:4:3$

Answer: B

View Text Solution

15. An open pipe of length 33 cm resonates with frequency of 100 Hz .

If the speed of sound is 330 m/s , then this frequency is

A. fourth

B. third

C. second

D. first

Answer: C

Watch Video Solution

16. If the velocity of sound in air is $320m/s$, then the maximum and minimum length of a pipe closed at one end , that would produce a just audible sound would be

A. 2 m

B. 4 m

C. 6 m

D. 1 m

Answer: B

Watch Video Solution

17. Why is the sound produced by an organ pipe open at both ends is better than that of an organ pipe closed at one end ?

A. In a closed pipe, the sound can not come out of the closed end while in the open pipe, sound can come out of both the ends.

B. A closed pipe produces only odd harmonics, while an open pipe produces all harmonics

C. A closed pipe produces only the fundamental frequency , while the open pipe produces the fundamental as well as the harmonics

D. an open pipe produces only the fundamental frequency but the closed pipe produces all harmonics

Answer: B

Watch Video Solution

18. If the fifth overtone of a closed pipe is in unison with the fifth overtone of an open pipe, then the ratio of the length of closed pipe to open pipe will be

A. $11:12$

B. $12:11$

C. $13:11$

D. $11:13$

Answer: A

Watch Video Solution

19. A tuning fork of frequency 480 Hz is in unison with the first overtone of a pipe closed at one end. What is the fundamental frequency of the closed pipe ?

A. 120 Hz

B. 140 Hz

C. 150 Hz

D. 160 Hz

Answer: D

Watch Video Solution

20. A pipe opened at both ends prpduces a note of frequency f_1. When the pipe is kept with $\frac{3}{4}th$ of its length in water, it produces a note of frequency f_2. The ratio $\frac{f_1}{f_2}$ is

A. $1:1$

B. $1:2$

C. $2:1$

D. $3:2$

Answer: C

Watch Video Solution

21. If the end correction of an open pipe is 0.8 cm, then the inner radius of that pipe will be

A. $\frac{1}{2}$cm

B. $\frac{1}{3}$ cm

C. $\frac{2}{3}$ cm

D. $\frac{3}{2}$ cm

Answer: C

Watch Video Solution

22. If the velocity of sound in air is 350 m/s . Then the fundamental frequency of an open organ pipe of length 50 cm, will be

A. 100 Hz

B. 250 Hz

C. 350 Hz

D. 400 Hz

Answer: C

Watch Video Solution

23. A closed organ pipe and an open organ pipe have their first overtones identical in frequency . Their lenghts are in the ratio

A. $1:2$

B. $2:3$

C. $3:4$

D. $4:5$

Answer: C

Watch Video Solution

24. Two organ pipes, closed at one end, when sounded together produce 3 beats/second. If their lengths are in the ratio of $101:100$, then the fundamental notes produced by them have the frequencies (in Hz)

A. 100 and 103

B. 206 and 203

C. 300 and 303

D. 400 and 403

Answer: C

Watch Video Solution

25. An air column in a pipe, which is closed at one end, will be in resonance with a tuning fork of frequency 200 Hz, if the length of the

air column is

[velocity of sound in air = 320 m/s]

A. 30 cm

B. 35 cm

C. 40 cm

D. 50 cm

Answer: C

Watch Video Solution

26. What should be the length of a closed pipe to produce resonance with sound waves of wavelength 62 cm ?

A. 31 cm

B. 15.5 cm

C. 45 cm

D. 20.5 cm

Answer: B

Watch Video Solution

27. The length of a pipe closed at one end is 33 cm and the speed of sound in air is 330 m/s. What is the frequency of the third overtone produced by the pipe ?

A. 1500Hz

B. 2000 Hz

C. 1750 Hz

D. 2500 Hz

Answer: C

Watch Video Solution

28. How will the fundamental frequency of a closed organ pipe be affected if instead of air, it is filled with a gas heavier than air?

A. there is no change in v

B. v will decrease

C. v will increase

D. v may increase or decrease

Answer: B

Watch Video Solution

29. Two open organ pipes A and B have the same length but their diameters are 5 cm and 3 cm respectively . Then the fundamental frequencies are related as

A. $n_A > n_B$

B. $n_A = n_B$

C. $n_A < n_B$

D. $n_A = \frac{3}{5} n_B$

Answer: C

Watch Video Solution

30. A tuning fork of known frequency $256 Hz$ makes 5 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per second when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was

A. 261 Hz

B. 251 Hz

C. 258 Hz

D. 254 Hz

Answer: B

Watch Video Solution

31. You are given an open pipe of length one metre. Which resonant harmonic will be produced, which a tuning fork of frequency 480 Hz ? (Velocity of sound = 320 m/s)

A. Second

B. Third

C. Fourth

D. Fifth

Answer: B

Watch Video Solution

32. The difference betweeen the freqencies of the second and third overtones of an air column in a pipe closed at one end is 160 Hz. What is the frequency of its first overtone ?

A. 100 Hz

B. 150 Hz

C. 240 Hz

D. 400 Hz

Answer: C

Watch Video Solution

33. A pipe of length 10 cm, closed at one end, has a frequency equal to half the 2nd overtone of another pipe open at both the ends. What is the length of the open pipe ?

A. 10 cm

B. 20 cm

C. 35 cm

D. 30 cm

Answer: D

Watch Video Solution

34. An open organ pipe has a length /and diameter d . If the velocity of sound in air is v, what is the fundamnetal frequency of the pipe when the end correction is spplied ?

A. $v(2l + 1.\ 2d)^{-1}$

B. $v(2l + 0.6d)^{-1}$

C. $v(2l + 0.3d)^{-1}$

D. $v(l + 0.6d)^{-1}$

Answer: A

Watch Video Solution

35. An organ piep has a fundamental frequency of 100 Hz. Its second overtone is 500 Hz. What is the nature of the pipe ?

A. Closed at one end

B. Open at both ends

C. Closed at both ends

D. Sometimes open sometimes closed

Answer: A

Watch Video Solution

36. If the length of an open pipe is kept constant but the diameter of the pipe is increased , then its frequency will diameter of the pipe is increased, then its frequency will

A. decrease

B. incerase

C. remain the same

D. first increase and then decrease

Answer: A

Watch Video Solution

37. In an open organ pipe the fundamental frequency is 30 Hz.

If the organ pipe is closed at one end, then the fundamental frequency will be

A. 10 Hz

B. 20 Hz

C. 30 Hz

D. 15 Hz

Answer: D

Watch Video Solution

38. Velocity of sound in air is $320ms^{-1}$. A pipe closed at one end has a length of 1 m. Neglecting end correction, the air column in the pipe cannot resonate with sound of frequency

A. 320 Hz

B. 80 Hz

C. 400 Hz

D. 240 Hz

Answer: A

Watch Video Solution

39. A pipe 20 cm long is closed at one end. Which harmonic mode of the pipe is resonantly excited by a source of 1237.5 Hz ? (sound velocity in air $= 330ms^{-1}$)

A. Second harmonic

B. Third harmonic

C. Fourth harmonic

D. Fifth harmonic

Answer: B

Watch Video Solution

40. An open and closed organ pipe have the same length the ratio pth mode of frequency of vibration of air in two pipe is

A. $p(2p+1)$

B. $\frac{2p}{2p-1}$

C. p

D. 1

Answer: B

Watch Video Solution

41. The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are (velocity of sound $= 340ms^{-1}$).

A. 7

B. 6

C. 4

D. 5

Answer: B

Watch Video Solution

42. The fundamental frequency of a closed organ pipe of length $20cm$ is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is

A. 100 cm

B. 120cm

C. 140 cm

D. 80 cm

Answer: B

Watch Video Solution

43. A 30 cm long pipe is open at both ends. Which harmonic mode of the pipe is resonantly excited by a 1.65 KHz source ? [Speed of sound in air = 330 m/s]

A. Third

B. Fourth

C. Second

D. First

Answer: A

Watch Video Solution

44. An open tube is in resonance with string (frequency of vibration of tube is n 0). If tube is dipped in water so that 75% of length of tube is inside water, then the ratio of the frequency of tube to string now will be

A. 1

B. $\frac{3}{2}$

C. $\frac{2}{3}$

D. 2

Answer: D

Watch Video Solution

45. The third harmonic of an open pipe is in resonance with a tuning fork of frequency 495 Hz. What is the lenngth of the open pipe if the

velocity of sound in air is 330 m/s?

(neglect the end correction)

A. 0.5 m

B. 0.75 m

C. 1 m

D. 1.2 m

Answer: C

Watch Video Solution

46. Which one of the following characteristics must remain constant for undamped oscillations of a particle ?

A. acceleration

B. amplitude

C. phase

D. velocity

Answer: B

Watch Video Solution

47. When a regiment of soldiers have to cross a suspension bridge, they are ordered to

A. march in steps

B. break the steps

C. stand in attention

D. stand at ease

Answer: B

Watch Video Solution

48. In the case of sustained force oscillations the amplitude of oscillations

A. decreases exponentially

B. decreases linearly

C. decreases sinusoidally

D. remains constnat

Answer: D

Watch Video Solution

49. In tuning of a radio receiver, we use the phenomenon of

A. beats

B. electrical resonance

C. acoustic resonance

D. doppler shift

Answer: B

Watch Video Solution

50. A tabla or a drum is an example of a

A. string instrument

B. percussion instrument

C. wind instrument

D. reed instrument

Answer: B

Watch Video Solution

51. A harmonium is a

A. percussion instrument

B. wind musical instrument

C. string instrument

D. reed instrument with pipes

Answer: B

Watch Video Solution

52. When a reciever of sound (e.g., microphone diaphragm or human eardrum) is receiving sound, the nature of its vibration is most likely to be

A. Free

B. Resonant

C. Damped

D. Forced

Answer: D

Watch Video Solution

53. In the absence of damping the amplitude of forced oscillation at resonance will be

A. Zero

B. Small

C. Infinite

D. Unaffected

Answer: C

Watch Video Solution

54. If a body oscillates at the angular frequency (ω_d) of the driving force, then the oscillations are called

A. free oscillations

B. resonant oscillations

C. forced oscillations

D. coupled oscillations

Answer: C

Watch Video Solution

55. In Melde's experiment, when a tuning fork vibrates in parallel mode, 4 loops are formed along the string of length L and under a tension T . The tuning fork is allowed to vibrate in perpendicular

mode, without changing any other thing, then the number of loops formed on the string will be

A. 4

B. 6

C. 8

D. zero

Answer: C

Watch Video Solution

56. In Melde's experiment , when the tuning fork is set in parallel position, the frequency of the string (n) and the frequency of the tuning fork (N) are related as

A. $n = N$

B. $n = 2N$

C. $n = \frac{N}{4}$

D. $n = \frac{N}{2}$

Answer: D

Watch Video Solution

57. When the tuning fork in Melde's experiment is arranged in parallel position, the string vibrates with a fundamental frequency of 80Hz. The frequency of the runing fork is

A. 80 Hz

B. 160 Hz

C. 40 Hz

D. 240 Hz

Answer: B

Watch Video Solution

58. Transverse position in Melde's experiment is changed to parallel position. If length of the string remains the same and tension is made half and if in perpendicular position 4 loops are formed then the number of loops formed in parallel position will be

A. 3

B. 1

C. 4

D. 2

Answer: D

View Text Solution

59. A chord attached about an end to a vibrating fork divides it into 6 loops when its tension is 36 N. The tension at which it will vibrate 4 loops is:

A. 36 N

B. 18 N

C. 54 N

D. 81 N

Answer: D

Watch Video Solution

60. In Melde's experiment , 4 loops were formed when the string was streteched by a weight of 8 gram. What weight should be used to double the number of loops without distrubing the set up ?

A. 1 gram wt

B. 2 gram wt

C. 4 gram wt

D. 6 gram wt

Answer: B

Watch Video Solution

61. If instead of water, the resonance tube is filled with a liquid of density higher than of water , then the resonating frequency

A. will increase

B. will decrease

C. will not change

D. may increase or decrease

Answer: C

Watch Video Solution

62. In a resonance tube experiment, a tuning fork resonates with an air column of length 12 cm and again resonates when it is 38cm long. The end correction will be

A. 0.25 cm

B. 0.5 cm

C. 0.75 cm

D. 1 cm

Answer: D

Watch Video Solution

63. In a resonance tube experiment, the first and second resonace occur, when the water levels in the tube are 25 cm and 80 cms below the open end respectively . What is the inner diameter of the resonance tube ?

A. $\frac{10}{3}$ cm

B. $\frac{20}{3}$ cm

C. $\frac{25}{3}$ cm

D. $\frac{40}{3}$ cm

Answer: C

Watch Video Solution

64. If a resonace tube gives two consecutive resonances at the length of 15 and 48 cm, then the velocity of sound in air is [frequency of fork = 500 Hz]

A. 320 m/s

B. 330 m/s

C. 340 m/s

D. 350 m/s

Answer: B

Watch Video Solution

65. An organ pipe open at one end is vibrating in first overtone and is in resonance with another pipe open at both ends and vibrating in third harmonic. The ratio of length of two pipes is–

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{8}{3}$

D. $\frac{1}{6}$

Answer: D

Watch Video Solution

66. A long glass tube is held vertically in water . A tuning fork is struck and held over the tube . Strong resonances are observed at two successive lengths $0.50m \text{ and } 0.84m$ above the surface of water . If the velocity of sound is $340m/s$, then the frequency of the tuning fork is

A. 125 Hz

B. 256 Hz

C. 500 Hz

D. 750 Hz

Answer: C

Watch Video Solution

67. In the resonance tube experiment , maximum sound is heard, when the lengths of the resonating air columns are

A. $\frac{\lambda}{4}, \frac{\lambda}{2}, \frac{3\lambda}{4}$

B. $\frac{\lambda}{2}, \lambda, \frac{3\lambda}{2}$

C. $\frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}$

D. $\frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}$

Answer: C

Watch Video Solution

68. In a resonance tube experiment the difference between the first and second resonating lengths is 15 cm.Then the wavelength of the sound wave is

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer: D

Watch Video Solution

69. A tuning fork is in unison with an air column of length 20 cm in a resonance tube experiment . If another identical resonance tube, whose length is more by 1 cm than the first tube is used , then 4 beats/second are heard with the same tuning fork. What is the frequency of the tuning fork ?

A. 80 Hz

B. 84 Hz

C. 90 Hz

D. 100 Hz

Answer: B

Watch Video Solution

70. In a resonace tube experiment, the first resonance is obtained when the level of the water in the tube is at 20 cm from the open end. Resonace will also be obtained when the distance of the water level from the open end is

A. 40 cm

B. 50 cm

C. 60 cm

D. 70 cm

Answer: C

Watch Video Solution

71. The end correction of a resonance column in resonance tube experiment is 0.5 cm. If the shortest length resonating with a tuning fork is 16 cm, then the next resonating length will be

A. 49 cm

B. 39 cm

C. 32 cm

D. 55 cm

Answer: A

Watch Video Solution

72. In a resonace tube experiment the lengths of the air columns for the first and second resonace differ by 25 cm . What is the wavelength of the sound in the tube ?

A. 20 cm

B. 30 cm

C. 40 cm

D. 50 cm

Answer: D

Watch Video Solution

73. For a resonace tube, the air columns for the first and second resonace differ in length by 15.5 cm . The wave length of the sound wave is

A. 15.5 cm

B. 46.5 cm

C. 31 cm

D. 50 cm

Answer: C

Watch Video Solution

74. In a resonace tube, the first resonating length is 0.2 m and the second resonating length is 0.62 m from the open end. What is the inner diameter of the tube ?

A. 6.66 cm

B. 4.67 cm

C. 3.33 cm

D. 2.33 cm

Answer: C

Watch Video Solution

75. In a resonance tube experiment t determine the speed of sound in air, a pipe of diameter $5cm$ is used. The air column in pipe resonates with a tuning fork of frequency $480Hz$ when the minimum length of the air column is $16cm$. If the speed of sound in air at room temperature $= 6\eta$ (in $m/\sec$). Find η

A. 330 m/s

B. 332 m/s

C. 334 m/s

D. 336 m/s

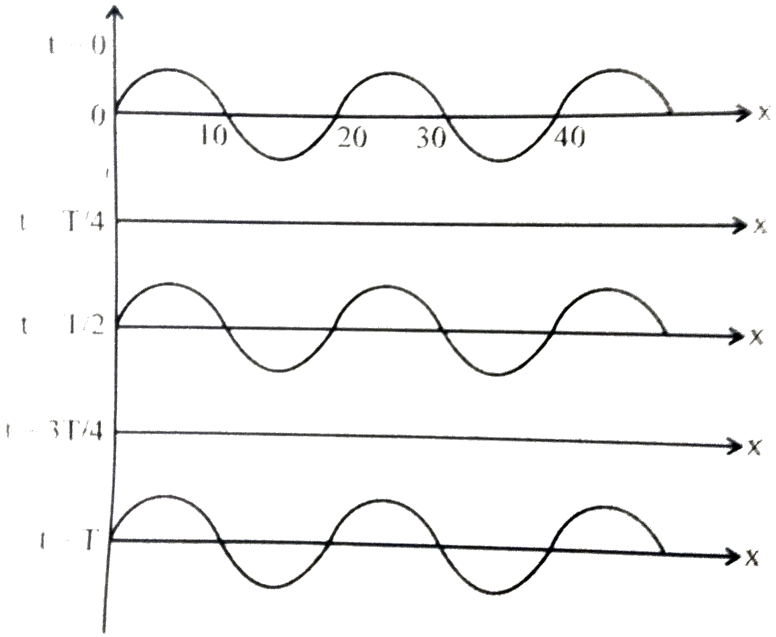
Answer: D

Watch Video Solution

Multiple Choice Questions Graphical

1. The wave patterns on a stretched string are as shown in the figure .

Interpret what kind of wave this is and what is its wavelength ?



A. Longitudinal , $\lambda = 10$ cm

B. Transverse , $\lambda = 20$ cm

C. Stationary , $\lambda = 20$ cm

D. Stationary , $\lambda = 10$ cm

Answer: C

View Text Solution

Multiple Choice Questions From Previous Exams

1. n_1 is the frequency of the pipe closed at one and n_2 is the frequency of the pipe open at both ends. If both are joined end to end, find the fundamental frequency of closed pipe so formed

A. $\frac{n_1 n_2}{2n_2 + n_1}$

B. $\frac{2n_2 n_1}{2n_2 + n_1}$

C. $\frac{2n_2 n_1}{n_1 + n_2}$

D. $\frac{n_2 + 2n_1}{n_1 n_2}$

Answer: A

Watch Video Solution

2. The value of end correction for an open organ pipe of radius r is _____ .

A. 0.8 r

B. 0.6r

C. 0.9r

D. 1.2r

Answer: D

Watch Video Solution

3. A sonometer wire vibrates with frequency n_1 in air under a suitable load of specific gravity $'\sigma'$. What the load is immersed in water , the frequency of vibration of wire (n_2) will be

A. $n_1\sqrt{\frac{\sigma+1}{\sigma}}$

B. $n_1\sqrt{\frac{\sigma-1}{\sigma}}$

C. $n_1\sqrt{\frac{\sigma}{\sigma+1}}$

D. $n_1\sqrt{\frac{\sigma}{\sigma-1}}$

Answer: B

Watch Video Solution

4. Wire having tension 225 N produces six beats per second when it is tuned with a fork. When tension changes to 256 N, it is tuned with the same fork, the number of beats remain unchanged. The frequency of the fork will be

A. 186 Hz

B. 225 Hz

C. 256 Hz

D. 280 Hz

Answer: A

Watch Video Solution

5. Two strings A and B made of same material are stretched by same tension. The radius of string A is double of the radius of B. A transverse wave travels on A with speed v_A and on B with speed v_B. The ratio $\frac{v_A}{v_B}$ is

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 2

D. 4

Answer: B

Watch Video Solution

6. When open pipe is closed from one end, then third overtone of closed pipe is higher in frequency by 150 Hz than second overtone of open pipe. The fundamental frequency of open end pipe will be

A. 75 Hz

B. 150 Hz

C. 225 Hz

D. 300 Hz

Answer: D

Watch Video Solution

7. If the end correction of an open pipe is 0.8 cm, then the inner radius of that pipe will be

A. $\frac{1}{3}$ cm

B. $\frac{2}{3}$ cm

C. $\frac{3}{2}$ cm

D. 0.2 cm

Answer: B

Watch Video Solution

8. The closed and open organ pipes have same length. When they are vibrating simultaneously in first overtone, produces three beats. The length of open pipe is made $\frac{1^{rd}}{3}$ and closed pipe is made three time the original the number of beats produced will be

A. 8

B. 14

C. 17

D. 20

Answer: C

Watch Video Solution

9. Two uniform wires of a the same material are vibrating under the same tension. If the first overtone of the first wire is equal to the second overtone of the second wire and radius of the first wire is twice the radius of the second wire, then the ratio of the lengths of the first wire to second wire is

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{5}$

D. $\frac{1}{6}$

Answer: A

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10. In sonometer experiment , the string of length 'L' under tension vibrates iin second overtone between two bridges. The amplitude of vibration is maximum at

A. $\frac{L}{3}, \frac{2L}{3}, \frac{5L}{6}$

B. $\frac{L}{8}, \frac{L}{4}, \frac{L}{2}$

C. $\frac{L}{2}, \frac{L}{4}, \frac{L}{6}$

D. $\frac{L}{6}, \frac{L}{2}, \frac{5L}{6}$

Answer: D

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11. The fundamental frequency of an air column in a pipe closed at one end is 100 Hz. If the same pipe is open at both the ends, the frequencies produced in Hz are

A. $100, 200, 300, 400, \ldots$.

B. $100, 300, 500, 700, \ldots$.

C. $200, 300, 400, 500, \ldots$.

D. $200, 400, 600, 800, \ldots$.

Answer: D

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Test Your Grasp 8

1. A string fixed at both the ends forms standing waves with node separation of 5 cm. If the velocity of waves travelling in the string is 4 m/s, then the frequency of vibration of the string will be

A. 20 Hz

B. 30 Hz

C. 40 Hz

D. 50 Hz

Answer: C

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2. For a stationary wave

$y = 10\sin\left(\frac{\pi x}{15}\right)\cos(48\pi t)$ cm, the distance between a node and the nearest antinode is

A. 15 cm

B. 7.5 cm

C. 30 cm

D. 60 cm

Answer: B

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3. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having a distance 1.21Å between them. The wavelength of the standing wave is

A. 6.05 Å

B. 1.21 Å

C. 2.42 Å

D. 3.63 Å

Answer: B

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4. A sonometer wire vibrating in its fundamental mode, is in unison with a tuning fork when the length of the wire between the bridges is 25 cm. By keeping the same tension , the length between the bridges is increased to 75 cm. The tuning fork can still be in resonance with the vibrating wire , provided the wire vibrates with

A. 2 loops

B. 4 loops

C. 5 loops

D. 3 loops

Answer: D

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5. The speed of transverse waves in a wire of length L , density ρ, cross - sectional area A and stretched with a tension T is given by

A. $\sqrt{\frac{TL}{\rho A}}$

B. $\sqrt{\frac{T}{A\rho}}$

C. $\sqrt{\frac{T}{\rho L}}$

D. $\sqrt{\frac{T\rho}{AL}}$

Answer: B

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6. A sonometer wire of length 79 cm emits a note of frequency 234 Hz. The length of the wire is then reduced by 1 cm and is allowed to vibrate. How many beats will be produced per sec with a tuning fork of frequency 240 Hz ?

A. 2

B. 3

C. 4

D. 5

Answer: B

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7. The velocity of transverse wave in a wire of density $8000k\frac{g}{m^3}$ is 300 m/s. The tensile stress in the wire is

A. $3.6 \times 10^8 \frac{N}{m^2}$

B. $7.2 \times 10^8 N/m^2$

C. $5 \times 10^8 N/m^2$

D. $2 \times 10^9 N/m^2$

Answer: B

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8. Two Cu wires of radii R_1 and R_2 are such that $(R_1 > R_2)$. Then which of the following is true ?

A. travel faster in the thinner wire

B. travel with the same velocity in both the wires

C. not travel through both the wires

D. travel faster in the thicker wire

Answer: A

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9. Two open organ pipes give 4 beats/sec when sounded together in their fundamental nodes. If the length of the pipe are 100 cm and 102.5 cm respectively, then the velocity of sound is :

A. 160 m/s

B. 260 m/s

C. 328 m/s

D. 450 m/s

Answer: C

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10. An organ pipe P_1 closed at one end vibrating in its first overtone and another pipe P_2 open at both ends vibrating in third overtone are in resonance with a given tuning fork . The ratio of the length of P_1 to that of P_2 is

A. $\frac{1}{8}$

B. $\frac{1}{2}$

C. $\frac{3}{8}$

D. $\frac{5}{8}$

Answer: C

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11. A closed organ pipe (closed at one end) is excited to support the third overtone. It is found that air in the pipe has

A. three nodes and three antinodes

B. three nodes and four antinodes

C. four nodes and three antinodes

D. four nodes and three antinodes

Answer: C

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12. For a certain organ pipe, three successive harmonics are 300 Hz, 420 Hz and 540 Hz. What is the frequency of the first overtone ?

A. 120 Hz

B. 180 Hz

C. 200 Hz

D. 240 Hz

Answer: B

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13. Two open organ pipes of fundamental frequencies n_1 and n_2 are joined in series. The fundamental frequency of the new pipes so obtained will be

A. $n_1 + n_2$

B. $\frac{n_1^2 + n_2^2}{2}$

C. $\frac{n_1 n_2}{n_1 + n_2}$

D. $\frac{n_1 + n_2}{n_1 n_2}$

Answer: C

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14. The amplitude of damped oscillator becomes half in one minute. The amplitude after 3 minutes will be $1/x$ times the original, where x is

A. 2×3

B. 2^3

C. 3×2^2

D. 3^2

Answer: B

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15. In Melde's experiment, 6 loops were formed, when the string was stretched by a weight of 6 grams. What weight should be used to produce 3 loops, without changing the experimental set up ?

A. 12 gram wt.

B. 18 gram wt.

C. 24 gram wt.

D. 16 gram wt.

Answer: C

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16. In Melde's exprtiment, the string vibrates in 4 loops when a weight of 50 gram is placed in the pan of weight 13 gram. How much weiight should be removed from the pan, to make the string vibrate in 6 loops ?

A. 28 gram

B. 35 gram

C. 40 gram

D. 42 gram

Answer: B

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17. In a resonance tube experiment, resonance occurs with a tuning fork of frequency 420 Hz, when the length of the air column is 19 cm. Resonance occurs again when the length is increased to 59 cm. When is the velocity of sound in air ?

A. 300 m/s

B. 336 m/s

C. 310 m/s

D. 320 m/s

Answer: B

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18. The end correction of a resonance colume is 1.0 cm.

If the shortest length resonating with the tuning fork is

15.0 cm the next resonating length will be

A. 35 cm

B. 40 cm

C. 47 cm

D. 64 cm

Answer: C

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19. A resonance jar of length 1m and small diameter is completely filled with water. The water can be slowly removed through a tube fixed near the bottom of the jar.

A tuning fork of frequency 550 Hz is kept vibrating near the upper end of the jar. If the velocity of sound is 330 m/s, then the maximum number of resonances that can be heard will be

A. 4

B. 1

C. 2

D. 3

Answer: D

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20. Two waves are approaching each other with a velocity of $20m/s$ and frequency n. The distance between two consecutive nudes is

A. $\frac{20}{n}$

B. $\frac{10}{n}$

C. $\frac{5}{n}$

D. $\frac{n}{10}$

Answer: B

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