LEVEL # 1

Questions based on Longitudinal wave velocity

Q.1 The ratio (V) of velocities of sound in dry air and humid air is -
(A) V < 1 (B) V > 1
(C) zero (D) V = 1

Q.2 The Laplace's formula for sound waves is -
(A) $V = \sqrt{\frac{P}{\rho}}$ (B) $V = \sqrt{\frac{\gamma P}{\rho}}$
(C) $V = \sqrt{\frac{\rho}{\gamma P}}$ (D) $V = \sqrt{\frac{P}{\gamma \rho}}$

Q.3 Sound waves are propagating in a medium. The moduli of isothermal and adiabatic elasticity of the medium are E_r and E_s respectively. The velocity of sound waves is proportional to -
(A) $\frac{E_s}{E_T}$ (B) $\sqrt{E_r}$ (C) $\sqrt{E_s}$ (D) E_r

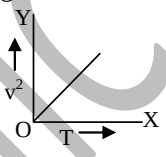
Q.4 If the air pressure is doubled at constant temperature, then the speed of sound will be become -
(A) Double
(B) Three times
(C) Four times
(D) Equal to its initial value

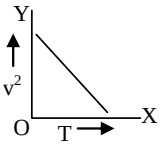
Q.5 At what temperature the speed of sound in air becomes double of its value of 0ºC -
(A) 273 K (B) 819 K
(C) 1092 K (D) 553 K

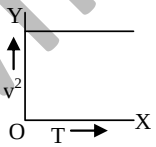
Q.6 The velocity of sound waves in an ideal gas at temperatures T_1K and T_2 K are respectively v_1 and v_2. The rms velocity of gas molecules at these two temperatures are w_1 and w_2, respectively then -
(A) $\frac{v_1}{v_2} = \frac{w_1}{w_2}$ (B) $\frac{v_1}{v_2} = \sqrt{\gamma}\,\frac{w_1}{w_2}$
(C) $\frac{v_1}{v_2} = \sqrt{\frac{\gamma}{3}}\,\frac{w_1}{w_2}$ (D) $\frac{v_1}{v_2} = \sqrt{\frac{w_1}{w_2}}$

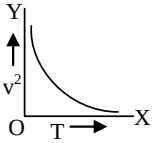
Q.7 The velocity of longitudinal waves in solid, is given by (where symbols have their usual meanings)-
(A) $v = \sqrt{\frac{T}{m}}$ (B) $v = \sqrt{\frac{Y}{\rho}}$
(C) $v = \sqrt{\frac{B}{\rho}}$ (D) $v = \sqrt{\frac{\gamma P}{\rho}}$

Q.8 The densities of two monoatomic gases are in the ratio of 16:9. The velocities of sound in gases having the same pressure will be in the ratio of
(A) 4 : 3 (B) 3 : 4 (C) 16 : 9 (D) 9 : 16

Q.9 The correct graph between v^2 (square of the speed of sound) and absolute temperature T of the gas is
(A) 

(B) 

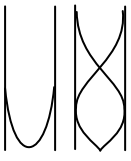
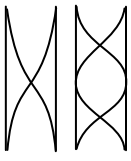
(C) 

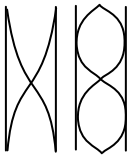
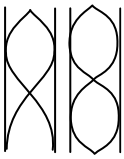
(D) 

Questions based on Longitudinal standing wave

Q.10 In the stationary waves in an open organ pipe -
(A) Both the ends are antinodes and in between them there is at least one node
(B) Both the ends are nodes and in between them there is at least one antinode
(C) Antinode at one end and node at the other
(D) Both the ends are antinodes and in between them there is no node.

Q.11 In open pipes, the positions of antinodes are obtained at -
(A) $0, \frac{\lambda}{2}, 2\lambda$ (B) $0, \frac{\lambda}{2}, \lambda$
(C) $\frac{\lambda}{4}, \frac{3\lambda}{4}, \lambda$ (D) $\frac{5\lambda}{4}, \frac{3\lambda}{4}$

Q.12 Modes of vibration in an open organ pipe are represented by –
(a) 
(b) 

(c)  (d) 

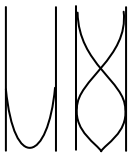
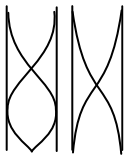
(A) a (B) b (C) c (D) d

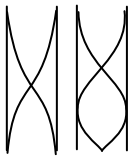
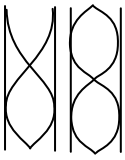
Q.13 In closed pipes, the positions of antinodes are obtained at –

(A) $\frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}$ (B) 0, $\frac{\lambda}{2}$, λ

(C) λ, 2λ, 3λ (D) 2λ, 4λ, 6λ

Q.14 Modes of vibration in a open organ pipe are represented by –

(a)  (b) 

(c)  (d) 

(A) a (B) b (C) c (D) d

Q.15 The first overtone of a closed pipe is given by –

(A) $n_2 = \frac{V}{4\ell}$ (B) $n_2 = \frac{3V}{4\ell}$

(C) $n_2 = \frac{5V}{4\ell}$ (D) $n_2 = \frac{7V}{4\ell}$

Q.16 The frequency of an open organ pipe is n. If one of its ends is closed then its fundamental frequency will be –

(A) 2n (B) n (C) n/2 (D) 3n/4

Q.17 In an open organ pipe, if the fundamental frequency is n, the overtones produced in it are in the ratio of-

(A) 2n : 3n : 4n (B) 2n : 4n : 8n

(C) 3n : 5n : 7n (D) 3n : 7n : 11n

Q.18 An open pipe of length 33cm resonates with frequency of 1000Hz. If the speed of sound is 330m/s, then this frequency is -

(A) The fundamental frequency of the pipe

(B) The first overtone of the pipe

(C) The second overtone of the pipe

(D) The fourth overtone of the pipe

Q.19 The velocity of sound in air is 333 m/s. The length of an open pipe, in order to produce second overtone of frequency 999 Hz in it, will be

(A) 1.5 m (B) 1.0 m (C) 0.5 m (D) 2 m

Q.20 The length of an open pipe is 48 cm and its fundamental frequency is 320 Hz. If one of the ends of the pipe is closed then its fundamental frequency will be- (V = 330m/s) –

(A) 160 Hz (B) 320 Hz

(C) 200 Hz (D) 240 Hz

Q.21 The ratio of the lengths of two closed pipes is 31/30. Their fundamental frequencies are in ratio of –

(A) $\frac{31}{30}$ (B) $\frac{30}{31}$ (C) $\frac{60}{31}$ (D) $\frac{31}{60}$

Q.22 The length of an open pipe is 0.5m and the velocity of sound in air is 332 m/sec. The fundamental frequency of the pipe is

(A) 166 Hz (B) 332 Hz

(C) 664 Hz (D) 996 Hz

Q.23 Velocity of sound in air is 332 m/sec. The shortest length of an open pipe which will resonate with a tuning fork of frequency 166Hz is

(A) 4.0 m (B) 2.0 m

(C) 1.0 m (D) 0.5 m

Q.24 With a closed end organ pipe of length ℓ, the fundamental tone has a frequency

(A) ($v/2\ell$) and all harmonics are present

(B) ($v/4\ell$) and all harmonic are present

(C) ($v/4\ell$) and only odd harmonics are present

(D) ($v/4\ell$) and only even harmonics are present

Q.25 For an open organ pipe of length ℓ the wavelength of the fundamental note is equal to-

(A) ℓ (B) $\ell/2$

(C) $\ell/4$ (D) 2ℓ

Q.26 A cylindrical tube, open at the both ends, has a fundamental frequency f 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) $f/2$ (B) $3f/4$ (C) f (D) $2f$

Q.27 An air column in a pipe, which is closed at one end. will be in resonance with a vibrating tuning fork of frequency 264 Hz if the length of the column in cm is-

(A) 31.25 (B) 62.50 (C) 93.75 (D) 125

Q.28 If length of a closed organ pipe is 1 m and velocity of sound is 330 m/s, then the frequency is-

(A) $4\left(\frac{330}{4}\right)$ (B) $3\left(\frac{330}{4}\right)$

(C) $2\left(\frac{330}{4}\right)$ (D) None

Q.29 In the open organ pipe, the fundamental frequency is 30 vibration /sec. If the organ pipe is closed, then the fundamental frequency will be-

(A) 10 vib/sec (B) 20 vib/sec
(C) 30 vib/sec (D) 15 vib/sec

Q.30 An open organ pipe sounds a fundamental note of frequency of 230 Hz . It the speed of sound in air is 330 m/s., then the length of the pipe is nearly-

(A) 0.25 m (B) 0.50 m
(C) 0.75 m (D) 2.00 m

Q.31 A tube closed at one end and containing air, produces, when excited , the fundamental note of frequency 512 Hz. If the tube is open at both ends, the fundamental frequency that can be excited is (in Hz) -

(A) 1024 (B) 512 (C) 256 (D) 128

Q.32 An organ pipe P_1 closed at one end vibrating in its first harmonic and another pipe P_2 open at both ends vibrating in its third harmonic are in resonance with a given tuning fork. The ratio of the length of P_1 to that of P_2 is-

(A) 8/3 (B) 1/6 (C) 1/2 (D) 1/3

Q.33 An organ pipe of effective length 0.6 m is closed at one end . Given that the speed of the sound in air is 300 m/sec, the two lowest frequencies for the pipe are-

(A) 250 Hz, 750 Hz (B) 250 Hz , 500 Hz
(C) 125 Hz, 375 Hz (D) 125 Hz , 250 Hz

Q.34 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 than the fundamental frequency of the open pipe. The fundamental frequency of the open pipe is –

(A) 200 Hz (B) 300 Hz
(C) 240 Hz (D) 480 Hz

Q.35 The velocity of sound in air is 330 m/s. Then the frequency that will resonate with an open pipe of length 1m is –

(A) 165 Hz (B) 330 Hz
(C) 495 Hz (D) All of the above

Q.36 An open pipe of length L and another open pipe of length (L + x) are sounded together. If the velocity of sound is V and x << L, then the beat frequency produced will be –

(A) $Vx^2/2L$ (B) $VL/2x^2$
(C) $Vx/2L^2$ (D) $VL^2/2x$

Questions based on Resonance tube experiment

Q.37 The wave produced in a resonating air column is-

(A) Progressive longitudinal
(B) Stationary longitudinal
(C) Progressive transverse
(D) stationary transverse

Q.38 In a long cylindrical tube , the water level is adjusted and the air column above it is made to vibrate in unison with a vibrating tuning fork kept at the open end . Maximum sound is heard when the air column lengths are equal to-

(A) $\frac{\lambda}{4}, \frac{\lambda}{2}, \frac{3\lambda}{4}$ (B) $\frac{\lambda}{2}, \lambda, \frac{3\lambda}{2}$

(C) $\frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}$ (D) $\frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}$

Q.39 The correct formula for determination of velocity of sound be resonance tube is –

(A) $V = n(\ell_2 - \ell_1)$ (B) $V = 2n(\ell_2 - \ell_1)$

(C) $V = \frac{2n}{(\ell_2 - \ell_1)}$ (D) $V = \frac{(\ell_2 - \ell_1)}{2n}$

Q.40 The approximate relation between the first and second resonance lengths of a resonance tube is –

(A) $\ell_2 = \ell_1$ (B) $\ell_2 = 2\ell_1$
(C) $\ell_2 = 3\ell_1$ (D) $\ell_2 = \ell_1/2$

Q.41 The first two resonance lengths in a resonance tube formed are 16.5 cm and 51cm. The end correction for the tube is –

(A) 0.25 cm (B) 0.50 cm
(C) 0.75 cm (D) 1.00 cm

Q.42 A resonance tube is resonated with tuning fork of frequency 256 Hz, If the lengths of resonating air columns are 32cm and 100cm, then end correction will be -

(A) 2cm (B) 4cm (C) 6 cm (D) 1 cm

Questions based on Beats

Q.43 To reduce the frequency of a tuning fork –
(A) It should be scraped by a file
(B) It should be loaded with a little wax.
(C) Either of (A) and (B)
(D) Neither of (A) and (B)

Q.44 The number of beats produced per second is equal to the –
(A) Sum of frequencies of two forks
(B) Difference of frequencies of two forks
(C) Ratio of frequencies of two forks
(D) Product of frequencies of two forks

Q.45 Beats are the result of -
(A) Diffraction
(B) Destructive interference
(C) Constructive and destructive interference
(D) Superposition of two waves of nearly equal frequencies

Q.46 Two adjacent piano keys are struck simultaneously. The notes emitted by them have frequencies n_1 and n_2 . The number of beats heard per sound is -
(A) $(n_1 - n_2)/2$ (B) $(n_1 + n_2)/2$
(C) $n_1 - n_2$ (D) $2(n_1 - n_2)$

Q.47 The fork A of frequency 100 is sounded with another tuning fork B. The number of beats produced is 2. On putting some wax on the prong of B, the number of beats reduces to 1. The frequency of the fork B is -
(A) 101 (B) 99 (C) 102 (D) 98

Q.48 If two tuning forks A and B are sounded together, they produce 4 beats per sound . A is then slightly loaded with wax, they produce two beats when sounded again. The frequency of A is 256. The frequency of B will be-
(A) 250 (B) 252 (C) 260 (D) 262

Q.49 56 tuning forks are so arranged in series that each fork gives 4 beats per sec with the pervious one. The frequency of the last fork is 3 times that of the first. The frequency of the first fork is -
(A) 110 (B) 56 (C) 60 (D) 52

Q.50 The frequency of a fork A is 3 % more than the frequency of a standard fork whereas the frequency of fork B is 3% less. The forks A and B produce 6 beats per second. The frequency of standard fork will be-
(A) 100 Hz (B) 106 Hz (C) 103 Hz (D) 112 Hz

Q.51 Beats are produced by two waves $y_1 = a \sin 2000\pi t$ and $y_2 = a \sin 2008\pi t$. The number of beats heard per second is-
(A) Zero (B) One (C) Four (D) Eight

Q.52 Two waves are $y = 0.25 \sin 316\, t$ and $y = 0.25 \sin 310\, t$ are travelling in same direction. The number of beats produced per second will be -
(A) 6 (B) 3 (C) $3/\pi$ (D) $\pi/3$

Q.53 A sources of sound gives 5 beats per second when sounded with another sources of frequency 100 second^{-1} . The second harmonic of the source, together with a source of frequency 205 second^{-1} gives 5 beats per second. What is the frequency of the source ?
(A) 95 second^{-1} (B) 100 second^{-1}
(C) 105 second^{-1} (D) 205 second^{-1}

Q.54 When tension in a string is 225N, then vibrating in fundamental mode it produces 6 beats per second with a tuning fork. The same string, when under tension of 256 N, again vibrating in fundamental mode produces with the same tuning fork 6 beats/sec. Then the frequency of the tuning fork is –
(A) 256Hz (B) 225Hz (C) 240Hz (D) 186Hz

Q.55 A sonometer wire is 31cm long is in resonance with a tuning fork of frequency n. If the length is increased by 1cm and it is vibrated with the same tuning fork, then 8 beats/sec are heard. The frequency of the tuning fork is –
(A) 248Hz (B) 256Hz (C) 264Hz (D) None

Q.56 A set of 24 tuning forks are so arranged that each gives 4 beats per second with the previous one and the last sounds the octave of the first. Then the frequency of the last fork is –
(A) 92 Hz (B) 184Hz (C) 116Hz (D) 160Hz

Q.57 Five beats per second are heard when a tuning fork is sounded together with a sonometer wire, when its length is either 95 cm or 100 cm. Then , the frequency of the tuning fork is -
(A) 190Hz (B) 195Hz (C) 200Hz (D) 185 Hz

Questions based on Characteristics of sound

Q.58 Voice of a child is more shrill than that of an elderly person because -
(A) The pitch of the child's voice is higher than that of the person
(B) The pitch is lower

(C) The child is more energetic
(D) None of the above

Q.59 The terms pitch, quality and loudness of sound are associated with the following, respectively –
(A) Intensity, frequency and waveform
(B) Frequency, intensity and waveform
(C) Frequency, waveform and intensity
(D) Waveform, frequency and intensity

ANSWER KEY

LEVEL # 1

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	B	C	D	C	A	B	B	A	A	B	B	A	A	B	C	A	B	C	A
Q.No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	B	B	C	C	D	C	A,C	B	D	C	A	B	C	A	D	C	B	D	B	C
Q.No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	C	A	B	B	D	C	C	B	A	A	C	C	C	D	B	B	B	A	C	C