1. Water waves are of the nature :
(1) Transverse
(2) Longitudinal
(3) Sometimes longitudinal and some times transverse and longitudinal both
(4) Neither transverse nor longitudinal

2. Sound wave are not polarized because :
(1) Their speed is less
(2) A medium is needed for their propagation
(3) These are longitudinal
(4) Their speed depands on temperature

3. Transverse waves can propagate
(1) only in solids
(2) both in solids and gases
(3) neither in solids nor in gases
(4) only in gases

4. Transverse elastic waves can be propagate in
(1) Both solid & gas
(2) In solid but not gas
(3) Neither solid nor gas
(4) None

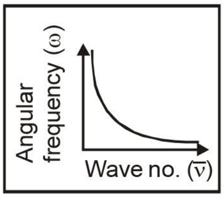
5. The equation of progressive wave is $Y = 4\sin\left\{\pi\left(\frac{t}{5}-\frac{x}{9}\right)+\frac{\pi}{6}\right\}$ where x and y are in cm. Which of the following statement is true ?
(1) λ = 18 cm
(2) amplitude=0.04 cm
(3) velocity v =50 cm/s
(4) frequency f = 20 Hz

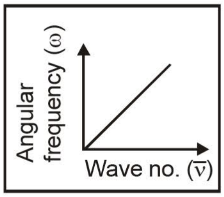
6. The equation y = 4 + 2 sin (6t – 3x) represents a wave motion with
(1) amplitude 6 units
(2) amplitude 4 units
(3) wave speed 2 units
(4) wave speed 1/2 units

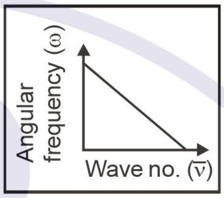
7. Due to propagation of longitudinal wave in a medium, the following quantities also propagate in the same direction :
(1) Energy, Momentum and Mass
(2) Energy
(3) Energy and Mass
(4) Energy and Linear Momentum

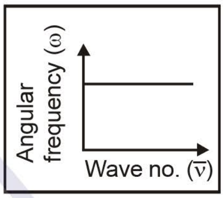
8. A wave of frequency 500 Hz travels between X and Y and travel a distance of 600 m in 2 seconds between X and Y. How many wavelength are there in distance XY :
(1) 1000 (2) 300 (3) 180 (4) 2000

9. The graph between wave number ($\bar{\nu}$) and angular frequency (ω) is :

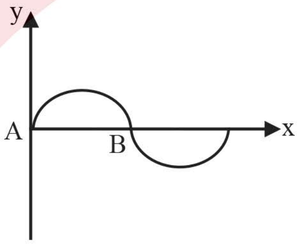
(1)


(2)


(3)


(4)


10. The figure shows an instantaneous profile of a rope carrying a progressive wave moving from left to right, then



(a) the phase at A is greater than the phase at B
(b) the phase at B is greater than the phase at A
(c) A is moving upwards
(d) B is moving upwards
(1) a & c (2) a & d (3) b & c (4) b & d

11. An earthquake generates both transverse (S) and longitudinal (P) sound waves in the earth. The speed of S waves is about 4.5 km/s and that of P waves is about 8.0 km/s. A seismograph records P and S waves from an earthquake. The first P wave arrives 4.0 min before the first S wave. The epicenter of the earthquake is located at a distance of about
(1) 25 km (2) 250 km
(3) 2500 km (4) 5000 km

12. The equation of a simple harmonic wave is given by $y = 3\sin\frac{\pi}{2}(50t - x)$, where x and y are in metres and t is in seconds. The ratio of maximum particle velocity to the wave velocity is :-
(1) 3π (2) $\frac{2}{3}\pi$ (3) 2π (4) $\frac{3}{2}\pi$

13. A wave in a string has an amplitude of 2cm. The wave travels in the + ve direction of x axis with a speed of 128 m/s and it is noted that 5 complete waves fit in 4 m length of the string. The equation describing the wave is :-

(1) y = (0.02) m sin (7.85x – 1005t)

(2) y = (0.02) m sin (7.85x + 1005t)

(3) y = (0.02) m sin (15.7x – 2010t)

(4) y = (0.02)m sin (15.7x + 2010t)

14. The velocities of sound at the same pressure in two monoatomic gases of densities ρ_1 and ρ_2 are v_1 and v_2 respectively. If $\frac{\rho_1}{\rho_2} = 4$, then the value of $\frac{v_1}{v_2}$ is :

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

15. A sound is produced in water and moves towards surface of water and some sound moves in air velocity of sound in water is 1450 m/s and that in air is 330 m/s. When sound moves from water to air then the effect on frequency f and wave length λ will be:

(1) f and λ will remain same

(2) f will remain same but λ will increase

(3) f will remain same but λ will decrease

(4) f will increase and λ will decrease

16. If υ_m is the velocity of sound in moist air and υ_d is the velocity of sound in dry air then :

(1) $\upsilon_m < \upsilon_d$ (2) $\upsilon_m > \upsilon_d$

(3) $\upsilon_d >> \upsilon_m$ (4) $\upsilon_m = \upsilon_d$

17. The equation of a wave on a string of linear density 0.04 kg m^{-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 :

(1) 6.25 N (2) 4.0 N

(3) 12.5 N (4) 0.5 N

18. A uniform rope of mass 0.1 kg and length 2.5 m hangs from ceiling. The speed of transverse wave in the rope at upper end and at a point 0.5 m distance from lower end will be :

(1) 5 m/s, 2.24 m/s (2) 10 m/s, 3.23 m/s

(3) 7.5 m/s, 1.2 m/s (4) 2.25 m/s, 5 m/s

19. A man standing on a cliff claps his hand and hears its echo after one second. If the sound in reflected from another mountain then the distance between the man & reflection points is V_{sound} = 340 m/sec.

(1) 680 m (2) 340 m

(3) 170 m (4) 85 m

20. If at some point the amplitude of the sound becomes double and the frequency becomes one fourth then at that point the intensity of sound will be :-

(1) Become double

(2) Be half

(3) Become one fourth

(4) Remain unchanged

21. What is your observation when two source are emitting sound with frequency 499 Hz & 501 Hz:

(1) Frequency of 500 Hz is heard with change in intensity takes place twice.

(2) Frequency of 500 Hz is heard with change in intensity takes place Once.

(3) Frequency of 2Hz is heard with change in intensity takes place Once.

(4) Frequency of 2Hz is heard with change in intensity takes place twice.

22. 16 tuning forks are arranged in increasing order of frequency. Any two consecutive tuning forks when sounded together produce 8 beats per second. If the freqency of last tuning fork is twice that of first then the frequency of first tuning fork is –

(1) 60 (2) 80 (3) 100 (4) 120

23. Frequency of tuning fork A is 256 Hz. It produces four beats/sec with tuning fork B. When wax is applied at tuning fork B then 6 beats/sec are heard. Frequency of B is :

(1) 252 (2) 260 Hz

(3) (1) & (2) both (4) 264

24. Frequency of tuning fork A is 256 Hz. It produces four beats/sec with tuning fork B. When wax is applied at tuning fork B then 6 beats/s are heard. By reducing little amount of wax 4 beats/s are heard. Frequency of B is :

(1) 250 Hz (2) 260 Hz

(3) 252 Hz (4) 256 Hz

25. A tuning fork produces 4 beats/sec. with another tuning fork B of frequency 288 Hz. If fork is loaded with little wax no. of beats per sec decreases. The frequency of the fork A, before loading is

(1) 290 Hz (2) 288 Hz
(3) 292 Hz (4) 284 Hz

26. Two sources of sound placed close to each other, are emitting progressive waves given by

$y_1 = 4 \sin 500\pi t$ and $y_2 = 5 \sin 508\pi t$

An observer located near these two sources will hear :-

(1) 8 beats per second with intensity ratio 81 : 1 between waxing and waning
(2) 4 beats per second with intensity ratio 81 : 1 between waxing and waning
(3) 4 beats per second with intensity ratio 25 : 16 between waxing and waning
(4) 8 beats per second with intensity ratio 25 : 16 between waxing and waning

27. Two waves of wave length 2 m and 2.02 m respectively moving with the same velocity and superimpose to produce 2 beats per second. The velocity of the waves is:

(1) 400.0 m/s (2) 402 m/s
(3) 404 m/s (4) 406 m/s

28. 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)

(1) 1024 (2) 512 (3) 256 (4) 128

29. An air column in 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 : [v = 330 m/s]

(1) 31.25 (2) 62.50 (3) 110 (4) 125

30. A hollow metallic tube of length L and closed at one end produce resonance with a tuning fork of frequency n . The entire tube is then heated carefully so that at equilbrium temperature its length changes by ℓ . If the change in velocity V of sound is v, the resonance will now be produced by tuning fork of frequency.

(1) $(V+v) / [4(L+\ell)]$ (2) $(V+v) / [4(L-\ell)]$
(3) $(V-v) / [4(L+\ell)]$ (4) $(V-v) / [4(L-\ell)]$

31. An organ pipe closed at one end has fundamental frequency of 1500 Hz. The maximum number of overtones generated by this pipe which a normal person can hear is

(1) 14 (2) 13 (3) 6 (4) 9

32. A wave $y = 10 \sin (ax + bt)$ is reflected from a dense medium at an origin. If 81% of energy is reflected then the equation of reflected wave is:

(1) $y = -8.1 \sin (ax - bt)$ (2) $y = 8.1 \sin (ax+bt)$
(3) $y = -9 \sin (bt - ax)$ (4) $y = 10 \sin (ax - bt)$

33. If the air column in a pipe which is closed at one end, is in resonance with a vibrating tuning fork of frequency 260 Hz, then the length of the air column is :

(1) 35.7 cm (2) 31.7 cm
(3) 12.5 cm (4) 62.5 cm

34. An open resonating tube has fundamental frequency of n. When half of its length is dipped into water, then its fundamental frequency will be:

(1) n (2) n/2 (3) 2n (4) 3/2 n.

35. For a certain organ pipe three successive resonable frequencies are observed at 425, 595 and 765 Hz respectively. Taking the speed of sound in air to be 340 m/sec (i) whether the pipe is closed end or open end (ii) determine the length of pipe.

(1) closed end, 1 m (2) open end, 1 m
(3) closed end, 2m (4) open end, 1 m

36. A cylindrical tube (L = 120 cm.) is resonant with a tuning fork of frequency 330 Hz. If it is filling by water then to get resonance minimum length of water column is (V_{air} = 330 m/s)

(1) 45 cm. (2) 60 cm.
(3) 25 cm. (4) 20 cm.

37. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe 50 cm long. The length of the open pipe will be

(1) 25 cm (2) 200 cm
(3) 50 cm (4) 100 cm

38. The two nearest harmonics of a tube closed at one end and open at other end are 460 Hz and 500 Hz. What is the fundamental frequency of the system?

(1) 20 Hz (2) 30 Hz
(3) 40 Hz (4) 10 Hz

39. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successiv resonances are produced at 40 cm and 93 cm column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is :-

(1) 330 m/s (2) 339 m/s
(3) 350 m/s (4) 300 m/s

40. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 40 cm. The next larger length of the column resonating with the same tuning fork is :

(1) 66.7 cm (2) 80 cm
(3) 120 cm (4) 150 cm

41. A wave of frequency 100 Hz travels along a string towards its fixed end. When this wave travels back, after reflection, a node is formed at a distance of 10 cm from the fixed end. The speed of the wave (incident and reflected) is :

(1) 5 m/s (2) 10 m/s (3) 20 m/s (4) 40 m/s

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

(1) Pluck at $\frac{\ell}{2}$ touch at $\frac{3\ell}{4}$

(2) Pluck at $\frac{\ell}{2}$ touch at $\frac{\ell}{4}$

(3) Pluck at $\frac{\ell}{4}$ touch at $\frac{3\ell}{4}$

(4) Pluck at $\frac{\ell}{4}$ touch at $\frac{\ell}{2}$

43. A tuning fork of frequency 512 Hz makes 4 beats per second with the vibrating string of a piano. The beat frequency decreases to 2 beats per seconds when the tension in the piano string is slightly increased. The frequency of the piano string before increasing the tension was :

(1) 508 Hz (2) 510 Hz (3) 514 Hz (4) 516 Hz

44. Two identical piano wires, kept under the same tension T have a fundamental frequency of 600 Hz. The fractional increase in the tension of one of the wires which will lead to occurrence of 6 beats/s when both the wires oscillate together would be :-

(1) 0.01 (2) 0.02 (3) 0.03 (4) 0.04

45. A source of unknown frequency gives 4 beats/s, when sounded with a source of known frequency 250 Hz. The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz. The unknown frequency is

(1) 260 Hz (2) 254 Hz (3) 246 Hz (4) 240 Hz

46. If n_1, n_2 and n_3 are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by :-

(1) $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$

(2) $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$

(3) $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$

(4) $n = n_1 + n_2 + n_3$

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

(1) 105 Hz (2) 155 Hz
(3) 205 Hz (4) 10.5 Hz

48. The tension in a stretched string fixed at both ends is changed by 2%, the fundamental frequency is found to get changed by 15 Hz. Select the incorrect statement

(1) Wavelength of the string of fundamental frequency does not change
(2) Velocity of propagation of wave changes by 2%
(3) Velocity of propagation of wave changes by 1%
(4) Original frequency is 1500 Hz

49. A string is rigided by two ends and its equation is given by $y = \cos 2\pi t \sin 2\pi x$

Then minimum length of string is

(1) 1m (2) 1/2m (3) 5m (4) 2π m

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

(1) $y = a\sin(\omega t + kx)$ (2) $y = -a\cos(\omega t - kx)$

(3) $y = -a\cos(\omega t + kx)$ (4) $y = -a\sin(\omega t - kx)$

51. A stretched string is 1 m long. Its mass per unit length is 0.5 g/m. It is stretched with a force of 20 N. It plucked at a distance of 25 cm from one end. The frequency of note emitted by it will be:

(1) 400 Hz (2) 300 Hz

(3) 200 Hz (4) 100 Hz

52. Two wires are fixed in a sonometer. Their tensions are in the ratio 8:1. The lengths are in the ratio 36:35. The diameters are in the ratio 4:1. Densities of the materials are in the ratio 1:2. If the higher frequency in the setting is 360 Hz, the beat frequency when the two wires sounded together is:

(1) 8 (2) 5 (3) 10 (4) 6

53. A sonometer wire resonates with a given tuning fork forming standing waves with five antinodes between the two bridges when a mass of 9kg is suspended from the wire. When this mass is replaced by mass M, the wire resonates with the same tuning fork forming three antinodes for the same positions of the bridges. Then find the value of square root of M.

(1) 5 (2) 10 (3) 25 (4) None

54. When a guitar string is sounded with a 440 Hz tuning fork a beat frequency of 5 Hz is heard. If the experiment is repeated with a tuning fork of 436 Hz the beat frequency is 9 Hz. The string frequency (Hz) is –

(1) 445 (2) 435 (3) 429 (4) 448

55. A string of linear mass density 4 g/cm is vibrating according to equation :-

$$y = A\sin(240\pi t)\cos\left(\frac{4\pi}{5}x\right)$$

where x is in centimeters.

Find the tension in the string

(1) 3.6 N (2) 36 N

(3) 7.2 N (4) 72 N

56. A uniform rope of length L and mass m hangs vertically from a rigid support. A block of mass 2m is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2. The ratio λ_2/λ_1 is :

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

(3) $\sqrt{2}$ (4) $\sqrt{3}$

57. A source and an observer moves away from each other, with a velocity of 15 m/s with respect to ground. If observer finds the frequency of sound coming from source as 1950 Hz. Then actual frequency of source will be

(velocity of sound = 340 m/s) :

(1) 1785 Hz (2) 1968 Hz

(3) 1950 Hz (4) 2130 Hz

58. Sound source of frequnecy 170 Hz is placed near a wall. A man walking from the source towards the wall finds, that there is periodic rise and fall of sound intensity. If the speed of sound in air is 340 m/s, then the distance separating the two adjacent portions of minimum intensity is:

(1) (1/2) m (2) (3/2) m

(3) 1 m (4) 2 m

59. A whistle revolves in a circle with angular speed $\omega = 20$ rad/sec using a string of length 50 cm. If the frequency of sound from the whistle is 385 Hz, then what is the minimum frequency heard by an observer which is far away from the centre: ($V_{sound} = 340$ m/s)

(1) 385 Hz (2) 374 Hz

(3) 394 Hz (4) 333 Hz

60. A source of frequency 200 Hz is moving towards an observer with a velocity equal to the sound velocity V. If observer also moves away from the source with same velocity then apparent frequency heard by observer will be :

(1) 50 Hz (2) 160 Hz

(3) 150 Hz (4) 200 Hz

61. A bus is moving with a velocity of 5 m/s towards a huge wall. The driver sounds a horn of frequency 165Hz. If the speed of sound in air is 335 m/s, No. of beats heared by a passenger on bus will be–

(1) 6 (2) 5 (3) 3 (4) 4

62. A body is walking away from a wall towards an observer at a speed of 1 m/s and blows a whistle whose frequency is 680 Hz. The number of beats heard by the observer per second is :-
(velocity of sound in air = 340 m/s)
(1) 4 (2) 8 (3) 2 (4) zero

63. A siren emitting a sound of frequency 900 Hz moves away from an observer towards a cliff at a speed of $30 ms^{-1}$. Then, the frequency of sound that the observer hears in the echo reflected from the cliff is :
(Take velocity of sound in air $= 330\ ms^{-1}$)
(1) 930 Hz (2) 960 Hz
(3) 990 Hz (4) 1000 Hz

64. The wavelength of the light received from a galaxy is 0.4% greater than the wave length on the earth then the velocity of galaxy relative to the earth will be:
(1) 1.2×10^{7} m/sec (2) 1.2×10^{6} m/sec
(3) 1.2×10^{5} m/sec (4) 1.2×10^{4} m/sec

65. Doppler effect for sound depends upon the relative motion of source and listener and it also depends upon that which one of these is in motion. Whereas in doppler effect for light it only depends upon the relative motion of the source of light and observer. The reason for it is :
(1) Einstein's mass energy relation
(2) Einstein's theory of relativity
(3) Photo electric effect
(4) none of above

66. Doppler effect for light differs from that for sound in regards that :
(1) the relative frequency shift is smaller for light than for sound.
(2) the velocity addition valid for sound is not true for light waves.
(3) velocity of light is very large as compared to sound.
(4) light waves are electromagnetic waves but sound waves are mechanical.

67. An observer moves towards a stationary source of sound with a speed 1/5th of the speed of sound. The wavelength and frequency of the source are λ and f respectively. The apparent frequency and wavelength recorded by the observer are respectively :–
(1) 1.2f, 1.2λ (2) 1.2f, λ
(3) f, 1.2λ (4) 0.8f, 0.8λ

68. An astronomical object is moving with such a speed that red shift of 1nm is observed in wavelength of 600 nm of wave received from it, the speed of wave is :-
(1) 5×10^{5} m/s (2) 4×10^{5} m/s
(3) 3×10^{5} m/s (4) 2×10^{5} m/s

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**3**	**2**	**2**	**1**	**3**	**4**	**1**	**2**	**2**	**3**	**4**	**1**	**2**	**3**
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	**2**	**1**	**1**	**3**	**3**	**1**	**4**	**3**	**2**	**3**	**2**	**3**	**1**	**1**	**1**
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	**3**	**3**	**2**	**1**	**1**	**1**	**4**	**1**	**2**	**3**	**3**	**4**	**1**	**2**	**2**
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	**1**	**1**	**2**	**2**	**3**	**3**	**3**	**1**	**1**	**1**	**2**	**4**	**3**	**2**	**4**
Que.	61	62	63	64	65	66	67	68							
Ans.	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**							