1. A travelling wave pulse is given by

$$y = \frac{4}{3x^2 + 48t^2 + 24xt + 2}$$

where x and y are in metre and t is in second. The velocity of wave is :-

(1) 4 m/s (2) 2 m/s

(3) 8 m/s (4) 12 m/s

2. Let speed of sound waves in hydrogen gas at room temperature is v_0. What will be the speed of sound waves in a room which contains an equimolar mixture of hydrogen and 'He' at same temperature :-

(1) $\sqrt{\frac{5}{7}}\,v_0$ (2) $\sqrt{\frac{7}{5}}\,v_0$

(3) $\sqrt{\frac{2}{5}}\,v_0$ (4) None

3. The displacement wave in a string is

$y = (3\text{ cm}) \sin 6.28\,(0.5x - 50t)$

where x is in centimetres and t in seconds. The velocity and wavelength of the wave is :-

(1) 2 cm, 100 cms^{-1}

(2) 10 cm, 50 cms^{-1}

(3) 20 cm, 2 ms^{-1}

(4) 2 m, 100 ms^{-1}

4. A uniform rope of mass 6kg hangs vertically from a rigid support. A block of mass 2kg is attached to the free end of the rope. Atransverse pulse of wavelength 0.06m is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is :-

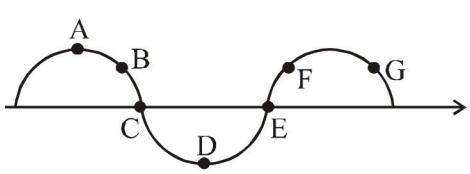
(1) 0.012m

(2) 0.06m

(3) 0.24m

(4) 0.12m

5. The following figure depicts a wave travelling in a medium. Which pair of particles are in phase :-



(1) A and D (2) B and F

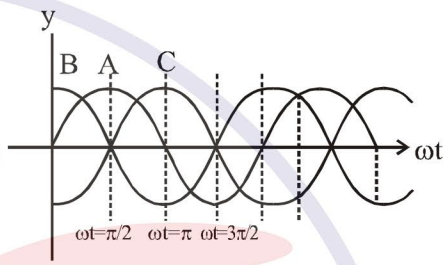
(3) C and E (4) B and G

6. A transverse periodic wave on a string with a linear mass density of 0.200 kg/m is described by the following equation $y = 0.05 \sin (420t - 21.0x)$

where x and y are in metres and t is in seconds. The tension in the string is equal to :

(1) 32 N (2) 42 N (3) 66 N (4) 80 N

7. The figure shows four progressive wave A,B,C & D. It can be concluded from the figure that with respect to wave A :-



(1) the wave C is ahead by a phase angle of $\pi/2$ & the wave B lags behind by a phase angle $\pi/2$

(2) the wave C lags behind by a phase angle of $\pi/2$ & the wave B is ahead by a phase angle of $\pi/2$

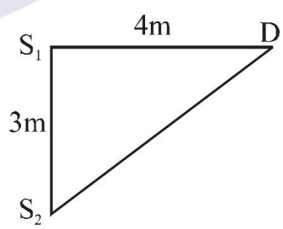
(3) the wave C is ahead by a phase angle of π & the wave B lags behind by the phase angle of π

(4) the wave C lags behind by a phase angle of π & the wave B is ahead by a phase angle of π

8. Under similar conditions of temperature and pressure, In which of the following gases the velocity of sound will be largest :-

(1) H_2 (2) N_2 (3) He (4) CO_2

9. In the figure the intensity of waves arriving at D from two coherent sources S_1 and S_2 is I_0. The wavelength of the wave is $\lambda = 4$m. Resultant intensity at D will be :-



(1) $4I_0$ (2) I_0 (3) $2I_0$ (4) zero

10. When a guitar 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 437 Hz, the beat frequency is 8 Hz. The string frequency (in Hz) is :-

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

11. Two waves are represented by: $y_1 = 4 \sin 404 \pi t$ and $y_2 = 3 \sin 400 \pi t$. Then :

(1) beat frequency is 4 Hz and the ratio of maximum to minimum intensity is 49 : 1

(2) beat frequency is 2 Hz and the ratio of maximum to minimum intensity is 49 : 1

(3) beat frequency is 2 Hz and the ratio of maximum to minimum intensity is 1 : 49

(4) beat frequency is 4 Hz and the ratio of maximum to minimum intensity is 1: 49

12. 41 tuning forks are arranged such that every fork gives 5 beats with the next. The last fork has a frequency that is double of the first. The frequency of the first fork is :-

(1) 200 (2) 400 (3) 205 (4) 210

13. The frequency of a radar is 780 MHz. The frequency of the reflected wave from an aeroplane is increased by 2.6 KHz. The velocity of air plane is :-

(1) 0.25 km/s (2) 0.5 km/s

(3) 1.0 km/s (4) 2.0 km/s

14. An aluminium rod having a length 100 cm is clamped at its middle point and set into longitudinal vibrations. Let the rod vibrate in its fundamental mode. The density of aluminium is 2600 kg/m^3 and its Young's modulus is 7.8×10^{10} N/m^2. The frequency of the sound produced is :-

(1) 1250 Hz (2) 2740 Hz

(3) 2350 Hz (4) 1685 Hz

15. What is the phase difference between the displacement wave and pressure wave in sound wave :-

(1) Zero (2) $\frac{\pi}{2}$ (3) π (4) $\frac{\pi}{4}$

16. A wire of length 'ℓ' having tension T and radius 'r' vibrates with fundamental frequency 'f'. Another wire of the same metal with length 2ℓ having tension 2T and radius 2r will vibrate with fundamental frequency :-

(1) f (2) 2f

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

17. Equation of a standing wave is generally expressed as $y = 2A \sin \omega t \cos kx$. In the equation, quantity ω/k represents :-

(1) the transverse speed of the particles of the string

(2) the speed of either of the component wave

(3) the speed of the standing wave

(4) a quantity that is independent of the properties of the string.

18. The wave - function for a certain standing wave on a string fixed at both ends is

$y(x,t) = 0.5 \sin (0.025\pi x) \cos 500\, t$

where x and y are in centimeters and t is in seconds. the shortest possible length of the string is :-

(1) 126 cm (2) 160 cm (3) 40 cm (4) 80 cm

19. A 2.0m long string with a linear mass density of 5.2×10^{-3} kg m^{-1} and tension 52N has both of its ends fixed. It vibrates in a standing wave pattern with four antinodes. Frequency of the vibraion is:-

(1) 75 Hz (2) 150 Hz (3) 100 Hz (4) 50 Hz

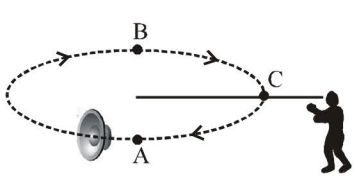
20. The length of a sonometer wire is 1.25m and density 8×10^3 kg/m^3. It can bear a stress of 3.2×10^8 N/m^2 without exceeding the elastic limit. The fundamental frequency that can be produced in the wire, is :-

(1) 100 Hz (2) 80 Hz (3) 200 Hz (4) 250 Hz

21. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in he apparent frequency :-

(1) 5% (2) 20% (3) zero (4) 0.5%

22. A small source of sound moves on a circle as shown in the figure and an observer is standing on O. Let n_1, n_2 and n_3 be the frequencies heard when the source is at A, B and C respectively. Then :-



(1) $n_1 > n_2 > n_3$ (2) $n_2 > n_3 > n_1$

(3) $n_1 = n_2 > n_3$ (4) $n_2 > n_1 > n_3$

23. A train is moving with 34 m/s towards a stationary observer. Train sound their whistle and observer observers its frequency as f_1. Now the speed of train is decreases to 17 m/s then observed frequency is f_2. If speed of sound is 340 m/s then the ratio of f_1/f_2 is :-

(1) 18/19 (2) 1/2 (3) 2 (4) 19/18

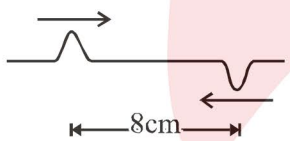
24. The first resonance length of a resonance tube is 40 cm and the second resonance length is 122 cm. the third resonance length of the tube will be :-

(1) 200 cm (2)202 cm (3) 203 cm (4) 204 cm

25. Two coherent sources of different intensities send waves which interfere. The ratio of the maximum intensity to the minimum intensity is 25. the intensities are in the ratio :-

(1) 25 : 1 (2) 5 ; 1 (3) 9 : 4 (4) 625 :1

26. Two pulses in a stretched string whose centres are initially 8 cm apart are moving towards each other as shown in the figure. The speed of each pulse is 2 cm/s. After 2 seconds, the total energy of the pulses will be :-



(1) zero

(2) purely kinetic

(3) purely potential

(4) partly kinetic and partly potential

27. In a string the speed of wave is 10 m/s and its frequancy is 100 Hz . The value of the phase difference at a distance 2.5 cm will be :

(1) $\pi/2$ (2) $\pi/8$ (3) $3\pi/2$ (4) 2π

28. The equation of a progressive wave are $Y = \sin\left[200\pi\left(t - \frac{x}{330}\right)\right]$, where x is in meter and f is in second. The frequency and velocity of wave are

(1) 100 Hz, 5 m/s

(2) 300 Hz, 100 m/s

(3) 100 Hz, 330 m/s

(4) 30 m/s, 5 Hz

29. A sine wave has an amplitude A and wavelength λ. Let V be wave velocity and v be the maximum velocity of a particle in medium then.

(1) V = v if $A = \frac{\lambda}{2\pi}$

(2) V can not be equal to v

(3) V = v if $\lambda = \frac{3A}{2\pi}$

(4) V= v if $A = 2\pi\lambda$

30. The time period of SHM of a particle is 12 s. The phase difference between the position at t = 3s and t = 4s will be :

(1) $\pi/4$ (2) $3\pi/5$ (3) $\pi/6$ (4) $\pi/2$

ANSWER KEY — Exercise-I

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