Wave Motion

1. The temperature at which the speed of sound in air becomes double of its value at $0^o C$ is

(a) 273^o *K* (b) 546^o *K* (c) 1092^o *K* (d) 0^o *K*

2. A wave travelling in positive X-direction with $A = 0.2m$ has a velocity of 360 *m/sec.* if $\lambda = 60m$, then correct expression for the wave is

(a) $y = 0.2\sin\left[2\pi\left(6t + \frac{x}{60}\right)\right]$ (b) $y = 0.2\sin\left[\pi\left(6t + \frac{x}{60}\right)\right]$

(c) $y = 0.2\sin\left[2\pi\left(6t - \frac{x}{60}\right)\right]$ (d) $y = 0.2\sin\left[\pi\left(6t - \frac{x}{60}\right)\right]$

3. The relation between phase difference and path difference is

(a) $\Delta\phi = \frac{2\pi}{\lambda}\Delta x$ (b) $\Delta\phi = 2\pi\lambda\Delta x$ (c) $\Delta\phi = \frac{2\pi\lambda}{\Delta x}$ (d) $\Delta\phi = \frac{2\Delta x}{\lambda}$

4. The frequency of a rod is 200 *Hz*. If the velocity of sound in air is 340 ms^{-1}, the wavelength of the sound produced is

(a) 1.7 *cm* (b) 6.8 *cm* (c) 1.7 *m* (d) 6.8 *m*

5. Two waves of lengths 50 *cm* and 51 *cm* produced 12 beats per second. The velocity of sound is

(a) 306 *m/s* (b) 331 *m/s* (c) 340 *m/s* (d) 360 *m/s*

6. In stationary longitudinal waves, nodes are points of

(a) Minimum pressure (b) Maximum pressure

(c) Minimum pressure variation (d) Maximum pressure variation

7. A metal wire of linear mass density of 9.8 *g/m* is stretched with a tension of 10 *kg* weight between two rigid supports 1 metre 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) 25 *Hz* (b) 50 *Hz* (c) 100 *Hz* (d) 200 *Hz*

8. 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) 256 + 5 *Hz* (b) 256 + 2*Hz* (c) 256 – 2 *Hz* (d) 256 – 5*Hz*

9. Two sound waves of wavelengths 5*m* and 6*m* formed 30 beats in 3 seconds. The velocity of sound is

(a) 300 ms^{-1} (b) 310 ms^{-1} (c) 320 ms^{-1} (d) 330 ms^{-1}

10. 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) $4\times\frac{330}{4}Hz$ (b) $3\times\frac{330}{4}Hz$ (c) $2\times\frac{330}{4}Hz$ (d) $2\times\frac{4}{330}Hz$

11. Out of the given four waves

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

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

Emitted by four different sources S_1, S_2, S_3 and S_4 respectively, interference phenomena would be observed in space under appropriate conditions when

(a) Source S_1 emits wave (1) and S_4 emits wave (4)

(b) Source S_2 emits wave (2) and S_4 emits wave (4)

(c) Source S_1 emits wave (1) and S_2 emits wave (3)

(d) Interference phenomenon cannot be observed by the combination of any of the above waves

12. The phase difference between the two particles situated on both the sides of a node is

(a) 0° (b) 90° (c) 180° (d) 360°

13. A car sounding a horn of frequency 1000 *Hz* passes an observer. The ratio of frequencies of the horn noted by the observer before and after passing of the car is 11 : 9. If the speed of sound is *v*, the speed of the car is

(a) $\frac{1}{10}v$ (b) $\frac{1}{2}v$ (c) $\frac{1}{5}v$ (d) *v*

14. What should be the velocity of a sound source moving towards a stationary observer so that apparent frequency is double the actual frequency (Velocity of sound is *v*)

(a) *v* (b) 2*v* (c) $\frac{v}{2}$ (d) $\frac{v}{4}$

15. When the source is moving towards the stationary observer, the apparent frequency is given by

(a) $n_1 = \frac{vn}{v - v_s}$ (b) $n_1 = \frac{vn}{v + v_s}$ (c) $n_1 = \frac{(v + v_o)n}{v}$ (d) $n_1 = \frac{v + v_o}{v - v_s}$