PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

WAVE MOTION

Example

1. An aluminium rod having a length of 90.0 cm is clamped at its middle point and is set into longitudinal vibrations by stroking it with a rosined cloth. Assume that the rod vibrates in it sfundmental mode of vibration. The density of aluminiumis $2600kgm^{-3}$ and it s Young's modulus is

$7.80 \times 10^{10} Nm^{-2}$. Find a. the speed of sound in aluminium, b. the wavelength of sound waves produced in the rod. c. THefrequency of the sound produced and d.the wavelength of the sound produced in air. Take the speed of sound in air t be $340 ms^{-1}$.

A. $5477 ms^{-1}$ and 30.42 Hz

B. $5000 ms^{-1}$ and 20.24 Hz

C. $3438 ms^{-1}$ and 60.34 Hz

D. None of the above

Answer: A

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2. What is the ratio of velocity of sound in hydrogen gas to that in air at NTP? (At NTP the density of hydrogen is $0.0009 \quad \text{gmcc}^{-1}$ and that of air $0.001 \quad \text{gmcc}^{-1}$)

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

B. $\sqrt{90}$

C. $\frac{\sqrt{10}}{3}$

D. $\frac{1}{\sqrt{90}}$

Answer: C

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3. The wavelength of sound from a turning fork of frequency 330 Hz is nearly

A. 100 cm

B. 1 cm

C. 10 cm

D. 330 cm

Answer: A

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4. A transverse wave is described by the equation $y = A\sin 2\pi\left(vt - \frac{x}{\lambda}\right)$. The maximum particle velocity is equal to four times the wave velocity if

A. $\lambda = \frac{\pi A}{4}$

B. $\lambda = \frac{\pi A}{2}$

C. $\lambda = \pi A$

D. $\lambda = 2\pi A$

Answer: B

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5. Sound signal of frequency 40 kHz is sent vertically into sea water. The signal gets reflected from the ocean bed and returns to the surface 0.60 s after it was emitted. The speed of sound in sea water is $1500 ms^{-1}$. What is the depth of the sea and wavelength of this signal in water.

A. 450 m, 3.75 cm

B. 9000m, 3.75 cm

C. 4500 m, 5 cm

D. 9000 m, 5 cm.

Answer: A

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6. Two waves are represented by the equations

$y_1 = a\sin(\omega t + kx + 0.785)$

and $y_2 = a\cos(\omega t + kx)$

where, x is in meter and t in second

The phase difference between them and resultant amplitude due to their superposition are

A. 45° and 1.84 a

B. 30° and a

C. 30° and 2a

D. 45° and a

Answer: A

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

$y_1 = 4\sin 600\pi t$

and $y_2 = 5\sin 608\pi t$

An observer located near these two sources of sound will hear

A. 4 beats per second with intensity ratio 25 : 16 between waxing and waning.

B. 8 beats per second with intensity ratio 25 : 16 between waxing and waning.

C. 8 beats per second with intensity ratio 81 : 1 between waxing and waning.

D. 4 beats per second with intensity ratio 81 : 1 between waning and waxing.

Answer: D

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8. An ambulance is traveling down a highway at $34.5ms^{-1}$. The ambulance having siren emits sound of frequency 380 Hz. If a passenger in a car travelling with the speed of $26.4ms^{-1}$ in the opposite direction as the car approaches the ambulance and after the two vehicles passed each other, then find the frequency heared by that passenger. Take speed of sound in air is $343ms^{-1}$

A. 100 Hz

B. 120 Hz

C. 136 Hz

D. None of these

Answer: C

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Exercise 1

1. The longitudinal wave can be observed in

A. elastic media

B. Inelastic media

C. Both of the above

D. None of these

Answer: A

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2. When a sound wave goes from one medium to another, the quantity that remains unchanged is :

A. frequency

B. amplitude

C. wavelength

D. speed

Answer: A

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3. The displacement of a particle in a medium can be expressed as

$y = 10^{-6} \sin(100t + 20x + \pi/4),$

where x is in metre and t is in second. What is the speed of the wave?

A. $2000ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. $5\pi ms^{-1}$

Answer: B

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4. A wave travelling in the negative x-direction having displacement along y-direction 2m, wavelength 2π m and frequency of $1/\pi$ Hz is represented by

A. $y = 2\sin(x + 2t)$

B. $y = 2\sin(2\pi x + 2\pi t)$

C. $y = 2\sin(10\pi x + 20\pi t)$

D. $y = 2\sin(2\pi x + 2\pi t)$

Answer: A

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5. The equation of a progressive wave is $y = 4\sin\left(4\pi t - 0.04x + \frac{\pi}{3}\right)$ where x is in metre and t is in second. The velocity of the wave is

A. $100\pi ms^{-1}$

B. $50\pi ms^{-1}$

C. $25\pi ms^{-1}$

D. πms^{-1}

Answer: A

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6. The equation of a wave is given by $y = 10\sin\left(\frac{2\pi}{45}t + \alpha\right)$. If the displacement is 5 cm at $t = 0$, then the total phase at $t = 7.5$ s is

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

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

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

D. π

Answer: B

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7. The phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is 90° . Then the velocity of wave will be

A. $720ms^{-1}$

B. $384ms^{-1}$

C. $250ms^{-1}$

D. $1ms^{-1}$

Answer: B

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8. The equation $y = 4 + 2\sin(6t - 3x)$ represents a wave motion. Then, wave speed and amplitude, respectively are

A. wave speed 1 unit, amplitude 6 unit

B. wave speed 2 unit, amplitude 2 unit

C. wave speed 4 unit, amplitude $1/2$ unit

D. wave speed $1/2$ unit, amplitude 5 unit

Answer: B

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9. Velocity of sound wave in air is 330 m/s for a particular sound in air.A path difference of 40 cm is equivalent to a

phase difference of 1.6 π. The frewuency of this wave is

A. 165 Hz

B. 150 Hz

C. 660 Hz

D. 330 Hz

Answer: C

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10. Of the following, the equation of progressive wave is

A. $y = a\sin\left(\omega t + kx^2\right)^2$

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

C. $y = \frac{a}{\sqrt{2}} \sin(\omega t^2 - kx^2)$

D. $y = \frac{a}{2} \sin(\omega t^2 - kx^2)$

Answer: B

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11. The equation of a wave travelling on a string is d

A. $64 cm s^{-1}$ in +X-direction

B. $32 cm s^{-1}$ in -X-direction

C. $32 cm s^{-1}$ in +X-direction

D. $64 cm s^{-1}$ in -X-direction

Answer: A

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12. Two points on a travelling wave having frequency 500 Hz and velocity $300ms^{-1}$ are 60° out of phase, then the minimum distance between the two point is

A. 0.2

B. 0.1 m

C. 0.5 m

D. 0.4 m

Answer: B

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13. A plane prohressive wave is given by $y = 2\cos 6.284(330t - X)$. What is period of the wave?

A. $\frac{1}{330}s$

B. $2\pi \times 330s$

C. $(2\pi \times 330)^{-1}s$

D. $\frac{6.284}{330}s$

Answer: A

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14. A wave is represented by the equation $y = 0.5\sin(10t - x)m$. It is a travelling wave propagating along the + x direction with velocity

A. $40ms^{-1}$

B. $20ms^{-1}$

C. $5ms^{-1}$

D. None of these

Answer: D

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15. A wave travelling along positive x -axis is given by $y = A\sin(\omega t - kx)$. If it is reflected from rigid boundary such that 80% amplitude is reflected, then equation of reflected wave is

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

B. $y = -0.8A\sin(\omega t + kx)$

C. $y = 0.8A\sin(\omega t + kx)$

D. $y = A\sin(\omega t + 0.8kx)$

Answer: B

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16. A transverse wave is derscried by the equation $y = y_0 \sin 2\pi\left(ft - \frac{x}{\lambda}\right)$. The maximum particle velocity is equal to four times the wave velocity if :-

A. $\lambda = \pi y_0 / 4$

B. $\lambda = 2\pi y_0$

C. $\lambda = \pi / y_0$

D. $\lambda = \pi y_0 / 2$

Answer: D

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17. Two waves are represented by the equations

$y_1 = a \sin(\omega t + kx + 0.57) m$ and

$y_2 = a \cos(\omega t + kx)$m,

where x is in metres and t is in seconds. The phase difference between them is

A. 1.25 rad

B. 1.57 rad

C. 0.57 rad

D. 1.0 rad

Answer: D

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18. Two sound waves travel in the same direction in a medium. The amplitude of each wave is A and the phase difference between the two waves is 120°. The resultant amplitude will be

A. $\sqrt{2}A$

B. $2A$

C. 3A

D. A

Answer: D

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19. Two waves of equal amplitude A, and equal frequency travel in the same direction in a medium. The amplitude of the resultant wave is

A. 0

B. A

C. 2A

D. between 0 to 2A

Answer: D

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20. The resultant wave when two given waves interfere is best represented by

A. 

B. 

C. 

D. None of these

Answer: A

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21. Sound waves are passing through two routes-one in straight path and the other along a semicircular path of radius r and are again combined into one pipe and superposed as shown in the figure. If the velocity of sound waves in the pipe is v, then frequencies of resultant waves of maximum amplitude will be multiples integral of

A. $\frac{v}{r(\pi-2)}$

B. $\frac{v}{r(v-1)}$

C. $\frac{2v}{r(\pi-1)}$

D. $\frac{v}{r(\pi+1)}$

Answer: A

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22. The path difference between the two waves

$$y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right) \text{ and } y(2) = a_2 \cos\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$$

is

A. $\frac{\lambda}{2\pi}(\phi)$

B. $\frac{\lambda}{2\pi}\left(\phi + \frac{\pi}{2}\right)$

C. $\frac{2\pi}{\lambda}\left(\phi - \frac{\pi}{2}\right)$

D. $\frac{2\pi}{\lambda}(\phi)$

Answer: B

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23. Four sound sources produce the following four waves

(i) $y_1 = a\sin(\omega t + \phi_1)$

(ii) $y_2 = a\sin 2\omega t$

(iii) $y_3 = a'\sin(\omega t + \phi_2)$

(iv) $y_4 = a'\sin(3\omega t + \phi)$

Superposition of which two waves gives rise to interference?

A. (i) and (ii)

B. (ii) and (iii)

C. (i) and (iii)

D. (iii) and (iv)

Answer: C

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24. The displacement equation of a particle of medium during wave mation is given by

$y = A\sin\omega t - B\cos\omega t$

The amplitude of the oscillator will be

A. $A - B$

B. $A + B$

C. $\sqrt{A^2 + B^2}$

D. $\left(A^2 + B^2\right)$

Answer: C

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25. Two waves

$y_1 = A_1 \sin(\omega t - \beta_1), y_2 = A_2 \sin(\omega t - \beta_2$

Superimpose to form a resultant wave whose amplitude is

A. $\sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \cos(\beta_1 - \beta_2)}$

B. $\sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \sin(\beta_1 - \beta_2)}$

C. $A_1 + A_2$

D. $|A_1 + A_2|$

Answer: A

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26. Two waves having the intensities in the ratio of $9:1$ produce interference. The ratio of maximum to minimum

intensity is equal to

A. $10:8$

B. $9:1$

C. $4:1$

D. $2:1$

Answer: C

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27. Two periodic waves of intensities I_1 and I_2 pass through a region at the same time in the same direction. The sum of the maximum and minimum intensities is:

A. $\frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{II_2}}$

B. $\frac{\sqrt{I_1^2 + I_2^2}}{\sqrt{I_1^2 - I_2^2}}$

C. $\frac{\sqrt{I_1} - \sqrt{I_2}}{\sqrt{I_1} + \sqrt{I_2}}$

D. $\left(\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right)^2$

Answer: D

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28. A point source emits sound equally in all directions in a non-absorbing medium. Two point P and Q are at distance of $2m$ and $3m$ respectively from the source. The ratio of the intensities of the wave at P and Q is :

A. $9:4$

B. $2:3$

C. $3:2$

D. $4:9$

Answer: A

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29. Two waves represented by the following equations are travelling in the same medium $y_1 5\sin 2\pi(75t - 0.25x), y_2 = 10\sin 2\pi(150t - \odot 50x)$

The intensity ratio I_1 / I_2 of the two waves is

A. $8:1$

B. $2:1$

C. $4:1$

D. $16:1$

Answer: C

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30. A particle is executing two different simple harmonic motions, mutually perpendicular, of different amplitudes and having phase difference of $\pi/2$. The path of the particle will be

A. circular

B. straight line

C. parabolic

D. elliptical

Answer: D

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31. The phenomena arising due to the superposition of waves is/are

A. beats

B. stationary waves

C. Lissajous figures

D. All of these

Answer: D

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32. Two sound waves of slightly different frequencies propagating in the same direction produce beats due to

A. interference

B. diffraction

C. reflection

D. refraction

Answer: A

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33. When two tuning forks A and B are sounded together, 4 beats per second are head. The frequency of the fork B is 348 Hz. When one of the prongs of the fork A is filled and sounded with B, the beat frequency increases, then the frequency of the fork A is

A. 379 Hz

B. 380 Hz

C. 389 Hz

D. 388 Hz

Answer: B

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34. A source frequency f gives t beats when sounded with a frequency 200Hz. The second harmonic of same source gives 10 beats when sounded with a source of frequency 420Hz. The value of f is

A. $200s^{-1}$

B. $205s^{-1}$

C. $195s^{-1}$

D. $210s^{-1}$

Answer: B

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35. Ten tuning forks are arranged in increasing order of frequency is such a way that any two nearest tuning forks produce $4be * /\sec$. The highest freqeuncy is twice of the lowest. Possible highest and the lowest frequencies are

A. 80 and 40

B. 100 and 50

C. 44 and 32

D. 72 and 36

Answer: D

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36. Number of beats between A and B is 5 and between B and C are 3. Number of beats between A and C may be

A. 1

B. 2

C. 8

D. Both B and C

Answer: D

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37. Beats are produced when two progressive waves of frequency 256 Hz and 260 Hz superpose. Then the resultant amplitude change periodically with frequency of

A. 256 Hz

B. 260 Hz

C. $\frac{256-260}{2}Hz$

D. 4 Hz

Answer: D

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38. When two harmonic sound waves of close but not equal) frequencies are heard at the same time, we hear

A. a sound of similar frequency

B. a sound of frequency which is the average of two close frequency which is the average of two close

frequencies

C. audibly distinct waxing and waning of the intensity of the sound with a frequency equal to the difference in the two close frequencies

D. All of the above

Answer: D

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39. Two vibrating tuning forks produce waves given by

$y_1 = 4\sin 53\pi t, y_2 = 2\sin 50\pi t$

If they are held near the ear of a person, the person will hear

A. 3 beats s^{-1} with intensity ratio of maximum to minima equal to 9

B. 3 beats s^{-1} with intensity ratio of maxima to minima equal to 2

C. 6 beats s^{-1} with intensity ratio of maxima to minima equal to 2

D. 6 beats s^{-1} with intensity ratio of maxima to minima equal to 9

Answer: B

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40. Two waves of wavelength 40 cm and 42 cm produce 15 beats s^{-1}. The velocity of sound will be

A. $340ms^{-1}$

B. $332ms^{-1}$

C. $126ms^{-1}$

D. $306ms^{-1}$

Answer: C

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41. There are three sources of sound of equal intensity with frequencies 400, 401 and 402 vib/sec . The number of beats heard per second is

A. zero

B. 1

C. 2

D. 4

Answer: C

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42. A train is approaching towards a platform with a speed of $10ms^{-1}$, while blowing a whistle of frequency 340 Hz. What is the frequency of whistle heard by a stationary observer on the platform ?

(given, speed of sound $= 340ms^{-1}$)

A. 330 Hz

B. 350 Hz

C. 340 Hz

D. 360 Hz

Answer: B

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43. A train approaches stationary observer, the velocity of train being $\frac{1}{20}$ of the velocity of sound. A sharp blast is blown with the whistle of the engine at equal intervals of 1s. The interval between the successive blasts as heard by the observer

A. $\frac{1}{20}$ s

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

C. $\frac{19}{20}$ s

D. $\frac{19}{20}$ min

Answer: C

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44. A train moving at a speed of $220ms^{-1}$ towards a stationary object emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is (speed of sound in air is $330ms^{-1}$)

A. 3500 Hz

B. 4000 Hz

C. 5000 Hz

D. 3000 Hz

Answer: C

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45. A source of sound emits sound waves at frequency f_0. It is moving towards an observer with fixed speed v_s ($v_s < v$, where v is the speed of sound in air). If the observer were to move towards the source with sped v_0, one of the following two graphs (A and B) wil given the correct variation of the frequency f heard by the observer as v_0 is changed. The

variation of f with v_0 is given correctly by

A. graph A with slope $= \frac{f_0}{(v + v_s)}$

B. graph B with slope $= \frac{f_0}{(v - v_s)}$

C. graph A with slope $= \frac{f_0}{(v - v_s)}$

D. graph B with slope $= \frac{f_0}{(v + v_s)}$

Answer: C

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46. A source of sound S is moving with a velocity of $50m/s$ towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the

apparent frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? The velocity of the sound in the medium is $350m/s$

A. 750 Hz

B. 857 Hz

C. 1143 Hz

D. 1333 Hz

Answer: A

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47. A bus is moving with a velocity of $5ms^{-1}$ towards a huge wall. The driver sound a horn of frequency 165 Hz. If the speed of sound in air is $335ms^{-1}$, the number of beats heard per second by a passenger inside the bus will be

A. 3

B. 4

C. 5

D. 6

Answer: C

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48. A train moves towards a stationary observer with speed 34 m/s. The train sounds a whistle and its frequency registered by the observer is f_1. If the speed of train is reduced to 17 m/s, the frequency registered is f_2. If speed fo sound is 340 m/s, then the ratio f_1 / f_2 is :

A. $18/19$

B. $1/2$

C. 2

D. $19/18$

Answer: D

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Exercise 2

1. The displacement x(in metres) of a particle performing simple harmonic motion is related to time t(in seconds) as $x = 0.05\cos\left(4\pi t + \frac{\pi}{4}\right)$ .the frequency of the motion will be

A. 0.5 Hz

B. 1.0 Hz

C. 1.5 Hz

D. 2.0 Hz

Answer: D

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2. Wave of frequency 500 Hz has a phase velocity $360m/s$. The phase difference between two displacement at a certain point at time $10^{-3}s$ apart will be

A. π rad

B. $\pi/2$ rad

C. $\pi/4$ rad

D. 2π rad

Answer: A

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3. If the speed of a wave doubles as it passes from shallow water into deeper water, its wavelength will be

A. unchanged

B. halved

C. doubled

D. quadrupled

Answer: C

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4. An observer is approaching a stationary source with a velocity $\frac{1}{4}$ th of the velocity of sound. Then the ratio of the apparent frequency to actual frequency of source is

A. $4:5$

B. $5:4$

C. $2:3$

D. $3:2$

Answer: B

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5. The resultant wave obtained when the above two waves interfere with each other is best represented as

A. 

B. 

C. 

D. None of these

Answer: C

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6. The temperature at which the speed of sound in air becomes double of its value at $27^\circ C$ is

A. $54^\circ C$

B. $327^\circ C$

C. $927^\circ C$

D. None of these

Answer: C

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

A. V cannot be equal to v

B. $V = v$, if $A = \frac{\lambda}{2\pi}$

C. $V - v$, if $A = 2\pi\lambda$

D. $V = v$, if $\lambda = \frac{A}{\pi}$

Answer: B

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8. Two waves represented by $y = a\sin(\omega t - kx)$ and $y = a\cos(\omega t - kx)$ are superposed. The resultant wave will

have an amplitude.

A. a

B. $\sqrt{2}a$

C. $2a$

D. zero

Answer: B

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9. A travelling wave in a stretched string is described by the equation $y = A\sin(kx - \omega t)$ the maximum particle velocity is

A. $A\omega$

B. ω / k

C. dx / dk

D. $x / 1$

Answer: A

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10. When two progressive waves $y_1 = 4\sin(2x - 6t)$ and $y_2 = 3\sin\left(2x - 6t - \frac{\pi}{2}\right)$ are superimposed, the amplitude of the resultant wave is

A. 5

B. 6

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

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

Answer: A

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11. Sound waves of $v = 60Hz$ fall normally on a perfectly reflecting wall. The shortest distance from the wall at which all particles will have maximum amplitude of vibration will be (Given, speed of sound $= 300ms^{-1}$)

A. $\frac{7}{8}m$

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

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

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

Answer: C

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12. 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. 4.0 N

B. 12.5 N

C. 0.5 N

D. 6.25 N

Answer: D

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13. The displacement y of a particle executing periodic motion is given by $y = 4\cos^2\left(\frac{1}{2}t\right)\sin(1000t)$

This expression may be considereed to be a result of the superposition of

A. 2

B. 3

C. 4

D. 5

Answer: B

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14. A progressive wave y = A sin (k x - ωt) is reflected by a rigid wall at x = 0 . Then the reflected wave can be represented by -

A. $y = a\sin(kx + \omega t)$

B. $y = a\cos(kx + \omega t)$

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

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

Answer: D

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15. A fork of unknown frequency gives 4 beats per second when sounded with another of frequency 256. The fork is

now loaded with a piece of wax and again 4 beats per second are heard. Calculate the frequency of the unknown fork.

A. 256 Hz

B. 252 Hz

C. 264 Hz

D. 260 Hz

Answer: D

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16. Beast are produced by frequencies v_1 and $v_2(v_1 > v_2)$. The duration of time between two sucessive maximum or

minima is equal to

A. $\frac{1}{v_1 + v_2}$

B. $\frac{2}{v_1 - v_2}$

C. $\frac{2}{v_1 + v_2}$

D. $\frac{1}{v_1 - v_2}$

Answer: D

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17. Two turning forks of frequencies n_1 and n_2 produces n beats per second. If n_2 and n are known, n_1 may be given by

A. $\frac{n_2}{n} + n_2$

B. $n_2 n$

C. $n_2 \pm n$

D. $\frac{n_2}{n} - n_2$

Answer: C

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18. A tuning fork of frequency 480 Hz produces 10 beats per second when sounded with a vibrating sonometer string. What must have been the frequency of the string if a slight increase in tension produces lesser beats per second than before

A. 490 Hz

B. 470 Hz

C. 460 Hz

D. 480 Hz

Answer: B

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19. Two sitar strings A and B are slightly out of tune and produce beats of frequency 5 Hz. When the tension in the string B is slightly increased, the beat frequency is found to reduce to 3 Hz. If the frequency of string A is 427 Hz, the original frequency of string B is

A. 460 Hz

B. 455 Hz

C. 445 Hz

D. 440 Hz

Answer: C

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20. Two tunning forks A and B produce notes of frequencies 256 Hz & 262 Hz respectively. An unknown note sounded at the same time with A produce beats. When the note is sounded with B, beats frequency is twice as large. The unknown frequency could be

A. 256 Hz

B. 254 Hz

C. 300 Hz

D. 280 Hz

Answer: B

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21. A source of sound gives five beats per second when sounded with another source of frequency $100s^{-1}$. The second harmonic of the source together with a source of frequency $205s^{-1}$ gives five beats per second. What is the ferquency of the source?

A. 105 Hz

B. 205 Hz

C. 95 Hz

D. 100 Hz

Answer: A

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22. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is $200Hz$, then what was the original frequency of fork 2 ?

A. 196 Hz

B. 200 Hz

C. 202 Hz

D. 204 Hz

Answer: A

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23. Two sound sources emitting sound each of wavelength λ are fixed at a given distance apart. A listener moves with a velocity u along the line joining the two suorces. The number of beats heard by him per second is

A. $\frac{2u}{\lambda}$

B. $\frac{u}{\lambda}$

C. $\frac{u}{3\lambda}$

D. $\frac{2\lambda}{u}$

Answer: A

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24. A source of sound of frequency 256 Hz is moving towards a wall with a velocity of 5 m/s. How many beats per second will be heard by an observer O standing in such a positoin that the source S is between O and wall? $\left(c = 330\frac{m}{s}\right)$

A. $\frac{256 \times 330}{325} - \frac{256 \times 330}{325}$

B. $256 - \frac{256x330}{325}$

C. $\frac{256 \times 330}{325} - \frac{256 \times 330}{325}$

D. $\frac{256 \times 330}{325} - 256$

Answer: C

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25. A bus is moving with a velocity of $5ms^{-1}$ towards a huge wall. The driver sound a horn of frequency 165 Hz. If the speed of sound in air is $335ms^{-1}$, the number of beats heard per second by a passenger inside the bus will be

A. 3

B. 4

C. 5

D. 6

Answer: C

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26. A sound wave of frequency f travels horizontally to the right. It is reflected from a large vertical plane surface moving to left with a speed v. The speed of sound in medium is C

A. the frequency of the reflected wave is $\left[\frac{c+v}{c-v}\right]$

B. the wavelength of the reflected wave is $\left[\frac{c}{n}\right]\left[\frac{c+v}{c-v}\right]$

C. the number of waves striking the surface per second is $\left[\frac{c+v}{c}\right] \times n$

D. the number of beats heard by a stationary listerner to the left to the reflecting surface is $\frac{nv}{c-v}$

Answer: C

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27. The equation of a wave travelling on a string is $y = 8\sin\left[\frac{\pi}{2}\left(4t - \frac{x}{16}\right)\right]$, where x, y are in cm and t in second. The velocity of the wave is

A. $256cms^{-1}$, in -x direction

B. $32cms^{-1}$, in -x direction

C. $32cms^{-1}$, in +x direction

D. $64cms^{-1}$, in +x direction

Answer: C

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28. The diagram shows the propagation of a progressive wave A, B, C, D, E, are five points on this wave.

Which points are in the same state of vibration?

A. A, B

B. B, C

C. B, D

D. E, B

Answer: D

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29. If the amplitude of a wave at a distance r from a point source is A, the amplitude at a distance $2r$ will be

A. A

B. 2A

C. $A/2$

D. $A/4$

Answer: C

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30. The equation of a progresive wave along a string is $y = 2x10^{-6}\sin\pi\left(\frac{t}{0.002} - \frac{x}{60}\right)$ where x is in cm and t is in second. What is the phase difference at any instant between two points which are 2 cm apart?

A. $\frac{\pi}{2}$ radian

B. $\frac{\pi}{15}$ radian

C. $\frac{\pi}{20}$ radian

D. $\frac{\pi}{30}$ radian

Answer: D

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1. A progressive wave is represented by $y = 12\sin(5t - 4x)$ cm. On this wave, how far away are the two points having phase difference of 90° ?

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

B. $\frac{\pi}{4}$ cm

C. $\frac{\pi}{8}$ cm

D. $\frac{\pi}{16}$ cm

Answer: C

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2. When the observer moves towards the stationary source with velocity, v_1, the apparent frequency of emitted note is

f_1. When the observer moves away from the source with velocity v_1, the apparent frequency is f_2. If v is the velocity of sound in air and $\frac{f_1}{f_2} = 2$,then $\frac{v}{v_1} = ?$

A. 2

B. 3

C. 4

D. 5

Answer: B

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3. The equation of a sound wave is $y = 0.0015\sin(62.4x + 316t)$ the wavelength of this wave

is

A. 0.2 unit

B. 0.1 unit

C. 0.3 unit

D. None of these

Answer: B

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4. The equation of a simple harmonic progressive wave is given by y = A sin $(100\pi t - 3x)$. Find the distance between 2 particles having a phase difference of $\frac{\pi}{3}$.

A. $\frac{\pi}{9}$ m

B. $\frac{\pi}{18}$ m

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

D. $\frac{\pi}{3}$ m

Answer: A

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5. The Pitch of the whistle of an engine appears to drop to $\frac{5}{6}$ th of original value when it passes a stationary observer if the speed of sound in air is 350 m/s then the speed of engine is

A. $35ms^{-1}$

B. $70ms^{-1}$

C. $105ms^{-1}$

D. $140ms^{-1}$

Answer: B

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6. A wave travelling in the $+ve$ x-direction having displacement along y-direction as $1m$, wavelength 2π m and frequency of $1/\pi$ Hz is represented by

A. $y = \sin(x - 2t)$

B. $y = \sin(2\pi x - 2\pi t)$

C. $y = \sin(10\pi x - 20\pi t)$

D. $y = \sin(2\pi x + 2\pi t)$

Answer: A

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7. 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 The unknown frequency is

A. 254 Hz

B. 246 Hz

C. 240 Hz

D. 260 Hz

Answer: A

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8. In sine wave , minimum distance between 2 particles always having same speed is

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

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

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

D. λ

Answer: A

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9. 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. Transverse wave travels faster in thicker wire

B. Transverse wave travels faster in thinner wire

C. Travels with the same speed in both the wires

D. Does not travel

Answer: B

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10. 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 the apparent frequency?

A. Zero

B. 0.5%

C. 5%

D. 20%

Answer: D

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11. The angle between particle velocity and wave velocity in transverse wave is

A. zero

B. $\pi/4$

C. $\pi/2$

D. π

Answer: C

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12. If a source emitting waves of frequency f moves towards an observer with a velocity $\frac{v}{4}$ and the observer moves away from the source with a velocity $\frac{v}{6}$, the apparent frequency as heard by the observer will be (v=velocity of sound)

A. $\frac{14}{15}f$

B. $\frac{14}{9}f$

C. $\frac{10}{9}f$

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

Answer: C

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13. 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

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

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

Answer: A

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14. Wavelength of wave is a distance between two particles in phase differing by

A. π

B. 2π

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

D. $\frac{\pi}{3}$

Answer: B

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15. Turning fork A of frequency 305 Hz produces 5 beats s^{-1} with another turing fork B. After filling tuning fork B, it produces 3 beats s^{-1} with A. The frequency of B before filling was

A. 300 Hz

B. 313 Hz

C. 310 Hz

D. 308 Hz

Answer: A

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16. A source is moving towards an observer with a speed of 20 m / s and having frequency of 240 Hz . The observer is now moving towards the source with a speed of 20 m / s . Apparent frequency heard by observer, if velocity of sound is 340 m / s , is

A. 270 Hz

B. 240 Hz

C. 268 Hz

D. 360 Hz

Answer: A

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17. What is the phase difference between two successive crests in the wave

A. π

B. $\pi/2$

C. 2π

D. 4π

Answer: C

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18. The phase difference between two points is $\pi/3$. If the frequency of wave is 50 Hz, then what is the distance

between two points?

$(\text{Given, } \ v = 330ms^{-1})$

A. 2.2 m

B. 1.1 m

C. 0.6 m

D. 1.7 m

Answer: B

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19. Two waves of wavelength 50 cm and 51 cm produce 12 beat/s . The speed of sound is

A. $340ms^{-1}$

B. $332ms^{-1}$

C. $153ms^{-1}$

D. $306ms^{-1}$

Answer: D

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20. The equation of a progressive wave is $y = 8\sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$. The wavelength of the wave is

A. 8 m

B. 4 m

C. 2 m

D. 10 m

Answer: A

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21. If wavelength of a wave is $\lambda = 6000\text{Å}$.Then wave number will be

A. $166 \times 10^3 m^{-1}$

B. $16.6 \times 10^1 m^{-1}$

C. $1.66 \times 10^6 m^{-1}$

D. $1.66 \times 10^7 m^{-1}$

Answer: C

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22. Two closed pipe produce 10 beats s^{-1} when emitting their fundamental nodes. If their lengths are in ratio of 25 : 26 their fundamental frequency (in Hz), are

A. 270, 280

B. 260, 270

C. 260, 250

D. 250, 260

Answer: D

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23. If the equation of transverse wave is $y = 5\sin 2\pi\left[\frac{t}{0.04} - \frac{x}{40}\right]$, where distance is in cm and time in second, then the wavelength of the wave is

A. 60 cm

B. 40 cm

C. 35 cm

D. 25 cm

Answer: B

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