(MHT-CET 2022)

10. An observer standing on the sea coast finds that 54 ripples reach the surface per minute. If the wavelength of the ripple be 10 m, then the wave velocity will be
a) 54 m/s b) 9 m/s c) 10 m/s d) 6 m/s

7.3 Transverse Waves and Longitudinal Waves

(MHT-CET 2018)

11. What is the phase difference between two successive crests in the transverse wave ?
a) π b) $\pi/2$ c) 2π d) 4π

(MHT-CET 2020)

12. When a longitudinal wave is incident on a rigid wall
a) compression is reflected as rarefaction with phase change of 0°
b) compression is reflected as rarefaction with phase change of 180°
c) compression is reflected as compression with no phase change
d) compression is reflected as compression with phase change of 180°

(MHT-CET 2021)

13. Which one of the following statements is true ?
a) The sound waves in air are longitudinal while the light waves in air are transverse.
b) Both light and sound waves in air are transverse.
c) Both light and sound waves in air are longitudinal.
d) The sound waves are transverse and light waves are longitudinal.

(MHT-CET 2022)

14. The velocity of a transverse wave in a string depends upon
a) length of the string
b) tension applied only
c) temperature
d) tension in the string and the linear density of the material

15. Two copper wires of radii 'r_1' and 'r_2' ($r_1 > r_2$) are subjected to same tension and are plucked. The transverse waves will
a) travel faster in the thinner wire
b) travel faster in the thicker wire
c) not travel through both the wires
d) travel with the same velocity in both the wires

7.4 Mathematical Equation of Waves

(MHT-CET 2002)

16. The equation of a progressive wave is

$y = 8 \sin\left[\pi\left(\frac{t}{10} - \frac{x}{4}\right) + \frac{\pi}{3}\right]$, where all quantities are in SI units. Then the wavelength of the wave is
a) 8 m b) 4 m c) 2 m d) 10 m

(MHT-CET 2021)

26. The velocity of sound in air is 'v_s'. If the density of air is doubled, then the velocity of sound will be

a) $2v_s$ b) v_s c) $\frac{v_s}{\sqrt{2}}$ d) $\frac{\sqrt{2}}{v_s}$

27. The frequency of a tuning fork is 'n' Hz and velocity of sound in air is 'v' m/s. When the tuning fork completes 'x' vibrations, the distance travelled by the wave is

a) $\frac{v}{xn}$ b) $\frac{vn}{x}$ c) $\frac{xv}{n}$ d) $\frac{x}{vn}$

28. A uniform metal wire has length 'L', mass 'M' and density 'ρ'. It is under tension 'T' and 'v' is the speed of transverse wave along the wire. The area of cross-section of the wire is

a) $\frac{T}{v^2\rho}$ b) $\frac{T}{v^2\rho^2}$ c) $\frac{v^2\rho^2}{T}$ d) $\frac{T}{v^2}$

29. What is the ratio of the velocity of sound in hydrogen $\left(\gamma=\frac{7}{5}\right)$ to that in helium $\left(\gamma=\frac{5}{3}\right)$ at the same temperature ?

a) $\frac{\sqrt{42}}{5}$ b) $\frac{5}{\sqrt{42}}$ c) $\frac{\sqrt{21}}{5}$ d) $\frac{5}{\sqrt{21}}$

30. Two tuning forks of frequencies 320 Hz and 480 Hz are sounded together to produce sound waves. The velocity of sound in air is 320 ms^{-1}. The difference between wavelengths of these waves is nearly

a) 48 cm b) 16.5 cm c) 33 cm d) 42 cm

(MHT-CET 2022)

31. At what temperature will the speed of sound be nearly 1.5 times its value at N.T.P.?

a) 409°C b) 136°C c) 614°C d) 341°C

32. The ratio of the speed of sound in helium gas to that in nitrogen gas at same temperature is

$(\gamma_{He}=\frac{5}{3}, \gamma_{N_2}=\frac{7}{5}, M_{He}=4, M_{N_2}=28)$

a) $\sqrt{\frac{5}{3}}$ b) $\frac{5}{\sqrt{3}}$ c) $\sqrt{\frac{2}{7}}$ d) $\sqrt{\frac{7}{5}}$

33. Velocity of sound in air is

a) inversely proportional to temperature.
b) more in dry air than in moist air.
c) directly proportional to pressure.
d) independent of pressure of air.

7.6 Principle of Superposition of Waves

(MHT-CET 2018)

34. What is phase difference between two waves, if the resultant amplitude due to their superposition is same as that of the waves ?

a) $\pi/2$ b) π c) $2\pi/3$ d) none of these

7.9 Doppler Effect

(MHT-CET 2004)

43. A source is moving towards observer with a speed of 20 ms^{-1} and having frequency 240 Hz and observer is moving towards source with a velocity of 20 ms^{-1}. What is the apparent frequency heard by observer, if velocity of sound is 340 ms^{-1} ?

a) 270 Hz b) 240 Hz c) 268 Hz d) 360 Hz

(MHT-CET 2007)

44. If a source emitting waves of frequency n 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

a) $\frac{14}{15}$ n b) $\frac{14}{9}$ n c) $\frac{10}{9}$ n d) $\frac{2}{3}$ n

(MHT-CET 2008)

45. 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%

(MHT-CET 2015)

46. The pitch of the whistle of an engine appears to drop to $\left(\frac{5}{6}\right)^{th}$ 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) 35 m/s b) 70 m/s c) 105 m/s d) 140 m/s

(MHT-CET 2020)

47. An obstacle is moving towards the source with velocity 'V'. The sound is reflected from the obstacle. If 'C' is the speed of sound and 'λ' is the wavelength, then the wavelength of the reflected wave (λ_r) is

a) $\lambda_r = \left(\frac{c-v}{c}\right)\lambda$ b) $\lambda_r = \left(\frac{c+v}{c}\right)\lambda$

c) $\lambda_r = \left(\frac{c-v}{c+v}\right)\lambda$ d) $\lambda_r = \left(\frac{c+v}{c-v}\right)\lambda$

48. A source of sound is moving with constant velocity of 30 m/s emitting a note of frequency 256 Hz. The ratio of frequencies observed by a stationary observer while the source is approaching him and after it crosses him is

a) 6 : 5 b) 9 : 8 c) 5 : 6 d) 8 : 9

49. An observer is approaching a stationary source with a velocity $\left(\frac{1}{4}\right)^{th}$ of the velocity of sound. Then, the ratio of the apparent frequency heard by the observer to the actual frequency of the source is

a) 5 : 4 b) 2 : 3 c) 3 : 2 d) 4 : 5

60. If two sound waves $y_1 = 5 \sin 300 \pi t$ and $y_2 = 4 \sin 302 \pi t$ are superimpose then the ratio of the maximum to minimum intensity of the sound will be

a) 5/4 b) 9/1 c) 81/1 d) 302/300

61. A uniform wire of length 20 m and weighing 5 kg hangs vertically. If $g = 10\ m/s^2$, then the speed of transverse waves at the middle of the wire will be

a) 10 m/s b) $10\sqrt{2}$ m/s c) 4 m/s d) zero m/s

62. When an observer moves towards a 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

63. An observer is moving with velocity 'v_0' towards a stationary source of sound and then after crossing moves away from the source with velocity 'v_0'. Assume that the medium through which the sound waves travel is at rest. If 'v' is the velocity of sound and 'n' is the frequency emitted by the source then the difference between apparent frequencies heard by the observer is

a) $\frac{2n v_0}{v}$ b) $\frac{n v_0}{v}$ c) $\frac{v}{2n v_0}$ d) $\frac{v}{n v_0}$

64. 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) v b) v / 10 c) v / 5 d) v / 100

65. A train blowing a whistle moves with a constant velocity 'v' away from an observer standing on the platform. The ratio of the natural frequency of the whistle 'n' to the apparent frequency is 1.2 : 1. If the train is at rest and the observer moves away from it at the same velocity 'v', the ratio of 'n' to the apparent frequency is

a) 1.52 : 1 b) 0.51 : 1 c) 2.05 : 1 d) 1.25 : 1

66. With what velocity an observer should move relative to a stationary source so that a sound of double the frequency of source is heard by the observer ?

a) Same as velocity of sound towards the source.

b) Twice the velocity of sound towards the source.

c) Half the velocity of sound towards the source.

d) Same as velocity of sound away from the source.

67. Sound waves take 3 minutes to travel between two stations, when the temperature of air is 27°C. If the temperature of air increases to 37°C, the sound waves will take how much time (in minutes) to travel between the two same stations ?

a) $3\sqrt{\frac{31}{30}}$ b) $2\sqrt{\frac{31}{30}}$ c) $2\sqrt{\frac{30}{31}}$ d) $3\sqrt{\frac{30}{31}}$

68. The temperature in degree Celsius at which the velocity of sound in air will be double its velocity at 0°C is
a) 546°C b) 819°C c) 1092°C d) 273°C

69. A source of sound is moving towards a stationary observer with velocity 'v_s' and then moves away with velocity 'v_s'. Assume that the medium through which the sound waves travel is at rest. If 'v' is the velocity of sound and 'n' is the frequency emitted by the source then the difference between the apparent frequencies heard by the observer is
a) $\frac{2nv\,v_s}{(v^2 - v_s^2)}$ b) $\frac{n^2 v\,v_s}{v^2 + v_s^2}$ c) $\frac{nv\,v_s}{(v^2 + v_s^2)}$ d) $\frac{nv\,v_s}{(v^2 - v_s^2)}$

70. Two sounding sources send waves at certain temperature in air of wavelength 50 cm and 50.5 cm respectively. The frequency of sources differ by 6 Hz. The velocity of sound in air at same temperature is **(MHT-CET 2023)**
a) 300 m/s b) 303 m/s c) 313 m/s d) 330 m/s

71. A train is moving towards a stationary observer with speed 34 m/s. A train sounds a whistle of frequency 450 Hz. If the speed of sound in air is 340 m/s, the frequency heard by the observer in Hz is **(MHT-CET 2023)**
a) 440 b) 480 c) 500 d) 540

72. When both source and listener are approaching each other the observed frequency of sound is given by (V_L and V_S is the velocity of listener and source respectively n_0 = radiated frequency) **(MHT-CET 2023)**
a) $n = n_0\left[\frac{V + V_L}{V - V_S}\right]$ b) $n = n_0\left[\frac{V - V_L}{V + V_S}\right]$ c) $n = n_0\left[\frac{V - V_L}{V - V_S}\right]$ d) $n = n_0\left[\frac{V + V_L}{V + V_S}\right]$

73. Regarding 'pitch of sound', which one of the following statements is 'WRONG'? **(MHT-CET 2024)**
a) Tone or pitch refers to the single frequency of that wave.
b) High pitch sound need not be louder.
c) Pitch refers to sharpness of the sound.
d) In general, male sound is sharper than a female sound.

74. A vibrating tuning fork produces concentric circular waves on the surface of water. The distance between 11 crests is 1 m and the velocity of the wave on the surface of water is 30 m/s. The frequency of the tuning fork is **(MHT-CET 2024)**
a) 200 Hz b) 250 Hz c) 300 Hz d) 400 Hz

75. An audio transmitter (T) and a receiver (R) are hung vertically from two identical massless strings of length 8 m with their pivots well separated along the X axis. They are pulled from the equilibrium position in opposite directions along the X axis by a small angular amplitude $\theta_0 = \cos^{-1}(0.9)$ and released simultaneously. If the natural frequency of the transmitter is 660 Hz and the speed of sound in air is 330 m/s, the maximum variation in the frequency (in Hz) as measured by the receiver (Take the acceleration due to gravity g = 10 m/s^2) is ___
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