PHYSICS

BOOKS - CENGAGE PHYSICS (HINGLISH)

SOUND WAVES AND DOPPLER EFFECT

Illustration

1. The equation of a sound wave in air is given by $\triangle p = (0.02)\sin[(3000)t - (9.0)x]$, where all variables are is SI units. (a) find the frequency, wavelength and the speed of sound wave in air. (b) If the equilibrium pressure of air is $1.01 \times 10^5 \frac{N}{m^2}$, What are the maximum and minimum pressure at a point as the wave passes through that point?

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2. Calculate the velocity of sound in air at NTP. The density of air at NTP is $1.29 g/L$. Assume air to be diatomic with $\gamma = 1.4$. Also calculate the velocity of sound in air at $27^{\circ} C$.

A. $347.6 m/s$

B. $695.2 m/s$

C. $331.6 m/s$

D. none of these

Answer: A

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3. Calculate the sterss in a tight wire of a material whose Young's modulus is $19.6 \times 10^{11} \frac{\text{dyne}}{cm^2}$ so that the speed of the longitudinal waves is 10 times the speed of transverse waves.

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4. Taking the composition of air to be 75% of nitrogen and 25% of oxygen by weight, calculate the velocity of sound through air.

A. $323.3m/s$

B. $331.3m/s$

C. $343.3m/s$

D. $339.3m/s$

Answer: B

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5. The velocity of sound in hydrogen at $0\,^{\circ}C$ is $1200m/s$. When some amount of oxygen is mixed with hydrogen, the velocity decreases to

$500 m/s$. Determine the ratio of H_2 to O_2 by volume in this mixture, given that the density of oxygen in 16 times that of hydrogen.

A. $1:2.2$

B. $1:4.2$

C. $4.2:1$

D. $2.2:1$

Answer: D

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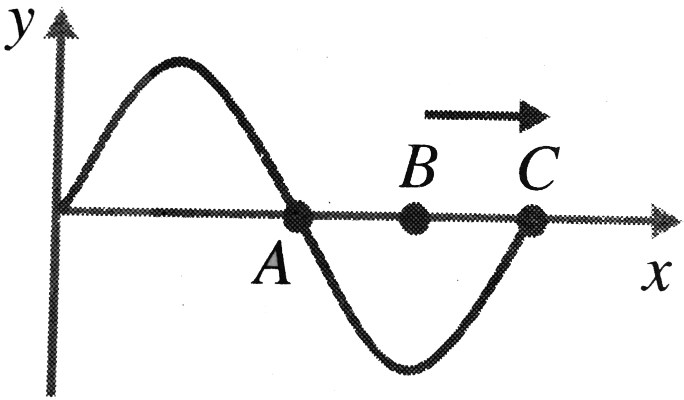

6.

The figure shows an instantaneous displacement position graph of a sound wave travelling along the positive x-axis Identify the points of

i.Maximum pressure,

ii. Minimum pressure and

iii. Atmospheric pressure (or normal pressure.)

A. (i) A, (ii) C, (iii)B

B. (i) A, (ii) B, (iii)C

C. (i) B, (ii) A, (iii)C

D. (i) B, (ii) C, (iii)A

Answer: A

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7. A point source emits sound waves with an average power output of 80.0 W (a) Find the intensity 3.00 m from the source. (b) find the distance at which the intensity of the sound is

$1.00 \times 10^{-8} \frac{W}{m^2}$

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amplitude and displacement amplitude associated with these two limits. Take speed of sound $= 342\frac{m}{s}$ and density of air $= 1.20\frac{kg}{m^3}$

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9. Two identical machines are positioned the same distance from a worker. The intensity of sound delivered by each operating machine at the worker's location is $2.0 \times 10^{-7}\frac{W}{m^2}$. (a) Find the sound level heard by the worker when one machine is operating. (b) Find the sound level heard by the worker when both the machines are operating.

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11. Calculate the sound level (in decibels) of a sound wave that has an intensity of $4.00\mu\frac{W}{m^2}$.

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12. A family ice show is held at an enclosed arena. The skaters perform to music with level 80.0dB. This level is too loud for your baby, who yells at 75.0 dB. (a) What total sound intensity engulfs you? (b) what is the combined sound level ?

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(a) What is the sky diver's speed of descent?

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A. 720 Hz

B. 920 Hz

C. 580 Hz

D. 680 Hz

Answer: D

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A. 600 Hz

B. 571 Hz

C. 680 Hz

D. 800 Hz

Answer: B

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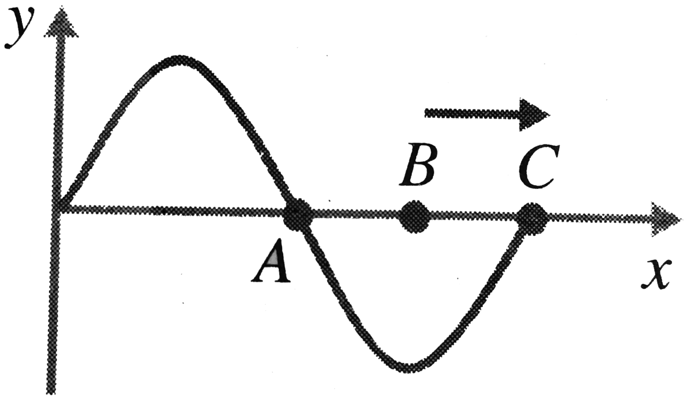

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A. $9.8 \times 10^{9} \frac{\text{dyne}}{cm^2}$

B. $19.6 \times 10^{9} \frac{\text{dyne}}{cm^{2}}$

C. $19.6 \times 10^{11} \frac{\text{dyne}}{cm^{2}}$

D. $9.8 \times 10^{11} \frac{\text{dyne}}{cm^{2}}$

Answer: B

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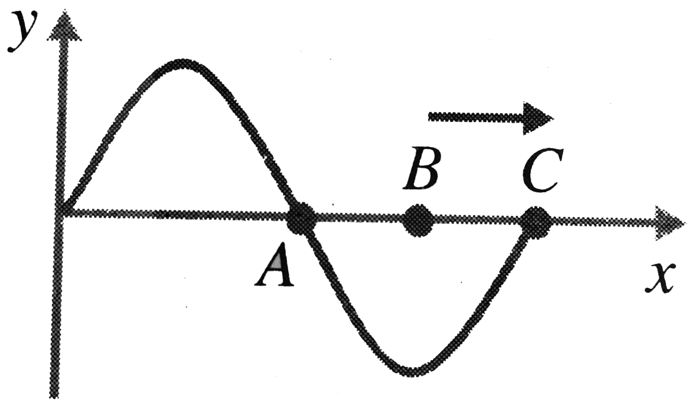

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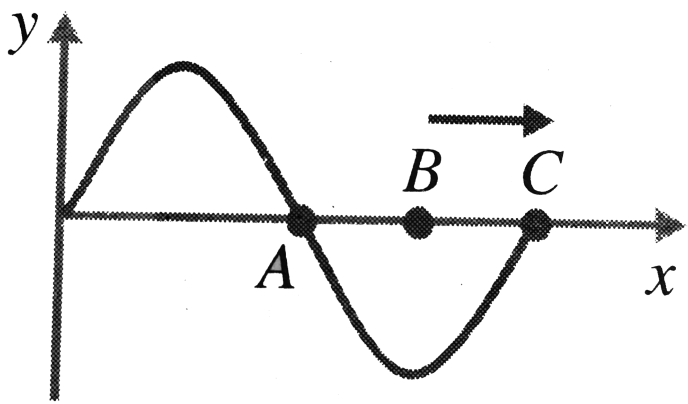

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84. To permit measurement of her speed a sky diver carries a buzzer emitting a steady tone

at 1800 Hz. A friend on the ground at the landing site directly below listens to the amplified sound he receives. Assume the air is calm and the sound speed is $343\frac{m}{s}$ independent of altitude. While the sky diver is falling at terminal speed, his friend on the ground receives waves of frequency 2150 Hz.

(a) What is the sky diver's speed of descent?

(b) Suppose the sky diver can hear the sound of the buzzer reflected from the ground. What frequency does she receive?

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85. Two trains A and B simultaneously start moving along parallel tracks from a station along same direction. A starts with constant acceleration $2\frac{m}{s^2}$ from rest, while B with the same acceleration but with initial velocity of 40 m/s. Twenty seconds after the start, passenger of A hears whistle of B. If frequency of whistle is 1194 Hz and velocity of sound in air is 322 m/s, calculate frequency observed by the passenger.

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86. A train approachign a railway crossing at a speed of $120kmh^{-1}$ sounds a short whistle at frequency 640 Hz when it is 300 m away from the crossing. The speed of sound in air is $340ms^{-1}$. What will be the frequency heard by a person standing on a road perpendicular to the track through the crossing at a distance of 400 m from the crossing ?

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87. Your clock radio awakens you with a steady and irritating sound of frequency 600 Hz. On morning, it malfunction and cannot be turned off. In frustration, you drop the clock radio out of your fourth-story dorm wndow 15.0m from the ground. Assume the speed of sound is 343 m/s. As you listen to the falling clock radio, what frequency do you hear just before you hear it striking the ground?

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88. A submarine Travels through water at a speed of $8.00\frac{m}{s}$, emitting a sonar wave at a frequency of 1400 Hz. The speed of sound in the water is 1533 m/s. What frequency is detected by an observer riding on another submarine moving with speed of $9.00\frac{m}{s}$ as the submarines approach each other?

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Examples

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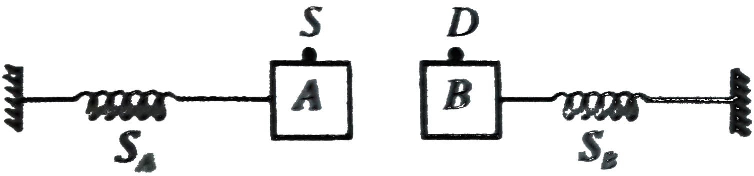
5. 

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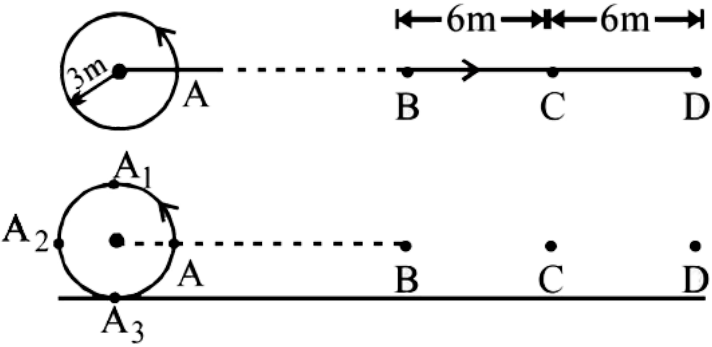

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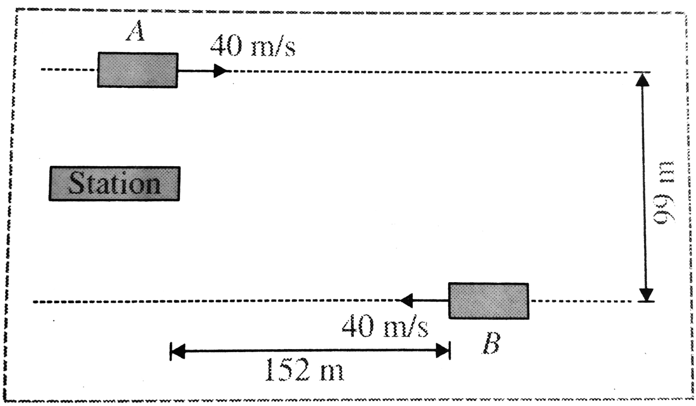

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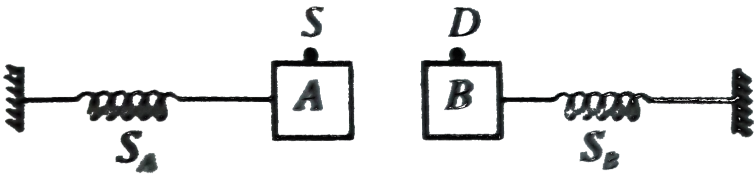

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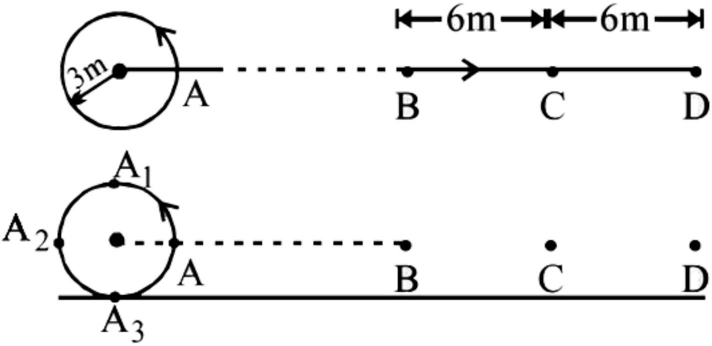

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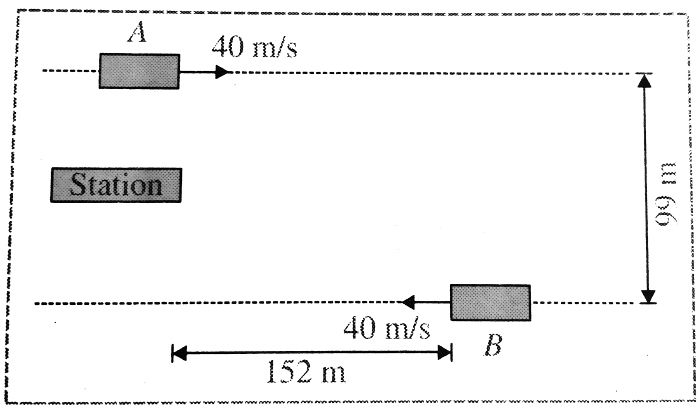

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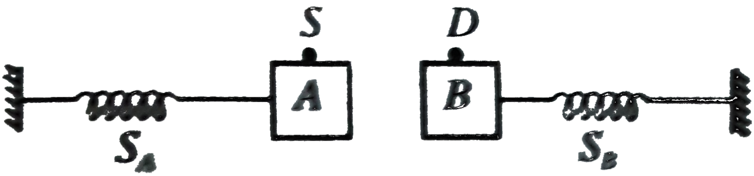

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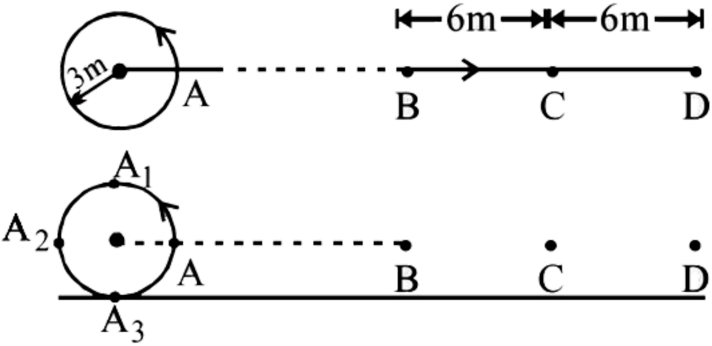

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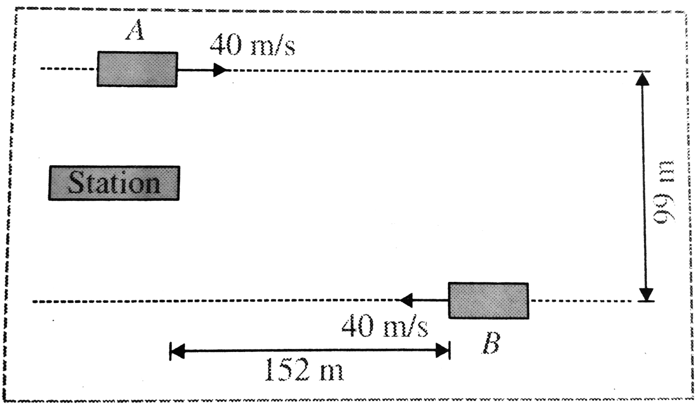

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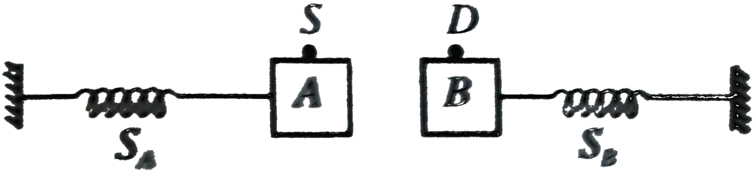
47. 

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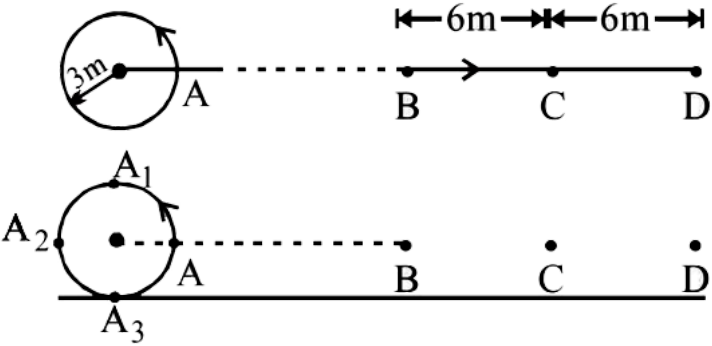

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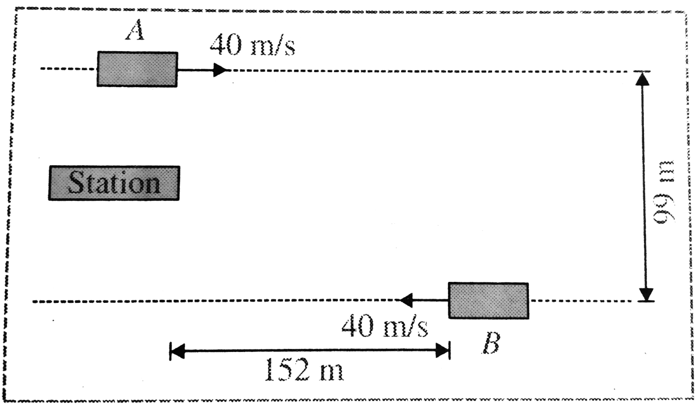

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Exercise 6.1

1. Do displacement particle velocity and pressure variation in a longitudinal wave vary with the same phase?

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2. Why is sound wave of intensity $10^{-12}\frac{W}{m^2}$ and frequency 1000 Hz taken as the standard for expressing the intensity level of all other sound waves?

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3. What experimental evidence can be cited to show that the speed of sound is the same for all wavelengths?

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4. Explain why the speed of sound through a gas cannot be greater than the r.m.s. speed of the molecules of the gas.

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9. Two sound waves from two different sources interfere at a point to yield a sound of varying intensity. The intensity level between the maximum and minimum is 20 dB. What is the ratio of the intensities of the individual waves?

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10. A sound differs by 6 dB from a sound of intensity equal to $10\frac{nW}{cm^2}$. Find the absolute value of intensity of the sound.

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11. Find the molecular weight for a gas in which the velocity of sound is $1260 m/s$ at $0^{\circ} C$ and whose γ is 1.4.

A. 2 g

B. 20 g

C. 4 g

D. 40 g

Answer: A

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12. Seven grams of nitrogen is mixed with 12 g of oxygen in a tube and then sealed. Calculate the velocity of sound through the tube at $27^{\circ}C$.

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13. Calculate the increase velocity of sound for $1^{\circ}C$ rise of temperature if the velocity of

sound at $0^{\circ}C$ is $332m/s$.

A. $1.61m/s$

B. $1m/s$

C. $0.61m/s$

D. None of these

Answer: C

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31. What experimental evidence can be cited to show that the speed of sound is the same for all wavelengths?

Watch Video Solution

32. Explain why the speed of sound through a gas cannot be greater than the r.m.s. speed of the molecules of the gas.

Watch Video Solution

33. Sound is more clearly heard with the wind

How?

Watch Video Solution

34. Explain: if an observer places his ear to one end of a long iron pipe line, he can distinctly hear two sounds when a man hammers the other end of the pipeline.

Watch Video Solution

35. Does the velocity of sound in a solid increase significantly on heating the solid?

Watch Video Solution

36. A man stands on the ground at a fixed distance from a siren which emits a clear sound dirung night that during day. Explain Why?

Watch Video Solution

37. Two sound waves from two different sources interfere at a point to yield a sound of varying intensity. The intensity level between the maximum and minimum is 20 dB. What is the ratio of the intensities of the individual waves?

Watch Video Solution

38. A sound differs by 6 dB from a sound of intensity equal to $10\frac{nW}{cm^2}$. Find the absolute value of intensity of the sound.

Watch Video Solution

39. Find the molecular weight for a gas in which the velocity of sound is $1260\frac{m}{s}$ at $0^{\circ}C$ and whose γ is 1.4.

Watch Video Solution

40. Seven grams of nitrogen is mixed with 12 g of oxygen in a tube and then sealed. Calculate the velocity of sound through the tube at $27^{\circ}C$.

Watch Video Solution

41. Calculate the increase velocity of sound for $1^{\circ}C$ rise of temperature if the velocity of sound at $0^{\circ}C$ is $332\frac{m}{s}$.

Watch Video Solution

42. If the sound level in a room is increased from 50 dB to 60 dB, by what factor is the pressure amplitude increased ?

Watch Video Solution

43. Do displacement, particle velocity and pressure variation in a longitudinal wave vary with the same phase?

Watch Video Solution

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Exercise 6.2

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Watch Video Solution

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Watch Video Solution

4. Is there a Doppler effect in the case of sound when the observer or the source moves at right angles to the line joining them? How then can we determine the Doppler effect when the motion has a component at right angles to this line?

Watch Video Solution

5. A source moves away from an obeserver with a certain speed, and the ratio of actual to the apparent frequency as heard by the observer in η. If the two approach each other with the same speed, then find the ratio.

Watch Video Solution

6. An engine blowing a whistle of frequency 133 Hz moves with a velocity of $60\frac{m}{s}$ towards a hiss from which an echo is heard. Calculate the frequency of the echo heard by the driver. (velocity of sound in air in $340\frac{m}{s}$.)

Watch Video Solution

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(a) The wavelength of the sound emitted in air by the source,

(b) the number of waves per second arriving at the reflecting surface, (c) The speed of the reflected waves and

(d) The wavelength of the reflected waves.

Watch Video Solution

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$\upsilon = 1200Hz$. If a wind blows at the speed of 0.1c deduce (i) the percentage change in the wavelength and (ii) the change in the frequency for a stationary observer on the wind side of the source. What happens when there is no wind, but the observer moves at speed 0.1c towards the source?

Watch Video Solution

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Watch Video Solution

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Watch Video Solution

11. A source of sonic oscillations with frequency $v_0 = 100 Hz$ moves at right angles to the wall with a velocity $u = 0.17 m/s$. Two stationary receivers R_1 and R_2 are located on a straight line, coinciding with the trajectory of the source , in the following succession :R_1 - source -R_2 - wall. Which receiver registers the beatings and what is the beat frequency ? The velocity of sound is equal to $\upsilon = 340 m/s$.

Watch Video Solution

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Watch Video Solution

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Watch Video Solution

14. The ratio of the apparent frequencies of a car when approaching and receding a stationary observer is 11:9 What is the speed of the car, if the velocity of sound in air is 330 m/s?

Watch Video Solution

15. A whistle emitting a sound of frequency $440h_z$ is tied to a string of $1.5m$ length and roated with an angular velocity of $20rad/s$ in the horizontal plane. Calculate the range of frequencies heard by an observer stationed at a larger distance from the whistle .(Speed of sound =$330m/s$) .

Watch Video Solution

16. A siren emitting a sound of frequency 2000 Hz moves away from you towards a cliff at a speed of 8 m/s.

(a) What is the frequency of the sound you hear coming directly from the siren.

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Watch Video Solution

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Watch Video Solution

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Watch Video Solution

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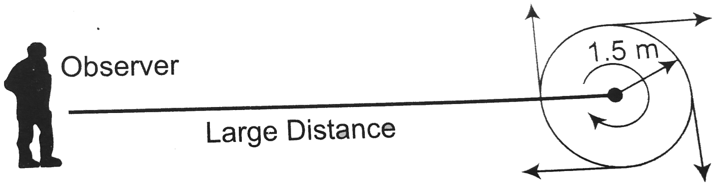
33. 

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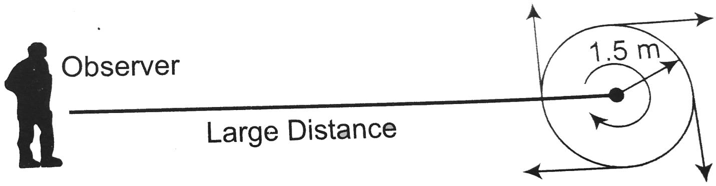
51. 

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Watch Video Solution

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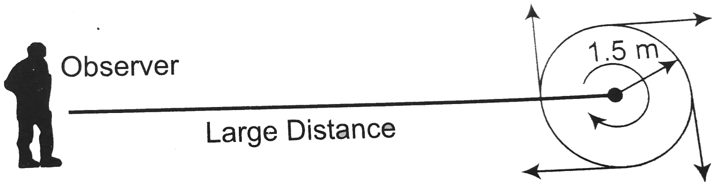
69. 

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Subjective

1. In a car race sound signals emitted by two cars are detected by the detector on the straight track at the end point of the race. Frequency observer is 330 Hz and 360 Hz and the original frequency is 300 Hz of both cars. Race ends with the separation of 100 m between the cars. Assume both cars move with constant velocity and velocity of sound is $330\frac{m}{s}$. Find the time taken by wining car.

Watch Video Solution

2. Airport authority has made the regulation that maximum allowable intensity level detected by a microphone situated at the end of 1630 m long runway can be 100 dB. An aeroplane when flying at a height of 200 m produces an intensity level of 100 dB on ground. while taking off, this aeroplane makes an angle of 30° with horizontal. Find the maximum distance this aeroplane can cover on the runway, so that the regulation are not violated (assume no reflection).

Watch Video Solution

3. (a) The power of sound from the speaker of a radio is 20 mW. By turning the knob of volume control the power of sound is increased to 400 mW, What is the power increase in dB as compared to original power?

(b) How much more intense is an 80 dB sound than a 20 dB whisper?

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4. The sound level at a point is increased by 30 dB. What is factor is the pressure amplitude increased?

Watch Video Solution

5. What is the maximum possible sound level in dB of sound waves in air? Given that density of air is $1.3\frac{kg}{m^3}$, $v = 332\frac{m}{s}$ and atmospheric pressure $P = 1.01 \times 10^5\frac{N}{m^2}$.

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6. A window whose area is $2m^2$ opens on street where the street noise result in an intensity level at the window of 60 dB. How much acoustic power enters the window via sound waves. Now if an acoustic absorber is fitted at the window, how much energy from street will it collect in 5 h?

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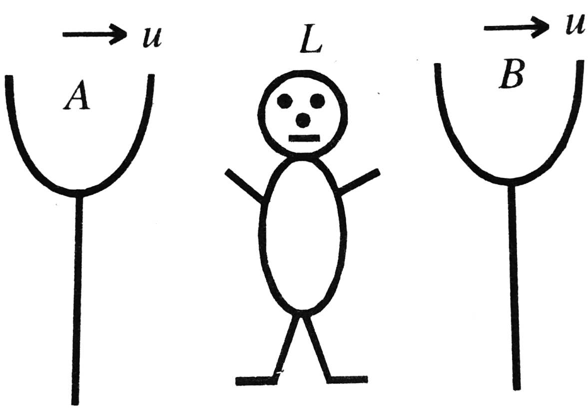
7. 

Two tuning forks A and B are vibrating at the same frequency 256 Hz. A listener is standing midway between the forks. If both tuning forks move to the right with a velocity of $5\frac{m}{s}$, find the number of beats heard per second by the listerner (speed of sound in air is $330\frac{m}{s}$).

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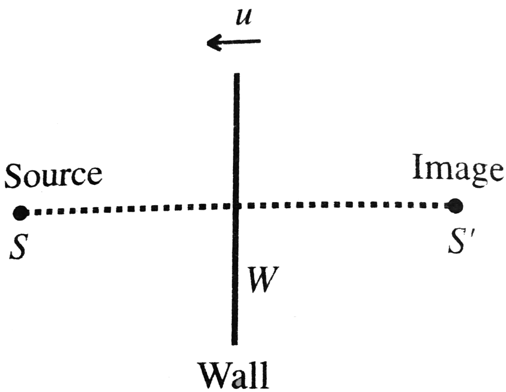

8. A driver in a stationary car horns which produces monochromatic sound waves of frequency $n = 1000Hz$, normally towards a reflecting wall. If the wall approaches the car will a velocity $u = 3.3\frac{m}{s}$, calculate the frequency of sound reflected from wall and heard by the driver. What is the percentage

change of sound frequency of reflection from the wall?

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9. The speed of sound in hydrogen gas at certain temperature is v $\frac{m}{s}$ Find the speed of sound in a gaseous mixture containing 2 moles of oxygen and 1 mole of hydrogen gas, at the same temperature. Assume the gases do no react at the ordinary temperature.

Watch Video Solution

10. A source of sound of frequency $256Hz$ is moving rapidly towards wall with a velocity of $5m/\sec$. How many beats per second will be heard if sound travels at a speed of $330m/\sec$.

Watch Video Solution

11. A vibrating tuning fork tied to the end of a string 1.988 m long is whirled round a circle. If it makes two revolutions in a second, calculate the ratio of the frequencies of the highest and the lowest notes heard by an observer situated in the plane of the tuning fork. Valocity of sound is 350 m/s.

Watch Video Solution

12. A source of sonic oscillations with frequency $n = 1700 Hz$ and a receiver are located on the same normal to a wall. Both the source and receiver are stationary, and the wall recedes from the source with velocity $u = 6.0\frac{m}{s}$. Find the beat frequency registered by the receiver. The velocity of sound is

$v = 340\frac{m}{s}$.

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13. A locomotive approaching a crossing at a speed of 80 mi/h sounds a whistle of frequency 400 Hz when 1 mi from the crossing. There is no wind, and the speed of sound in air is 0.200mi/s. What frequency is heard by an observer 0.60 mi from the crossing on the straight road which crosses the railroad at right angles?

Watch Video Solution

14. A whistle of frequency 540 Hz is moving in a circle of radius 2 ft at a constant angular speed of 15 rad/s. What are the lowest and highest frequencies heard by a listener standing at rest, a long distance away from the centre of the circle? (Velocity of sound in air is 1100ft/s)

Watch Video Solution

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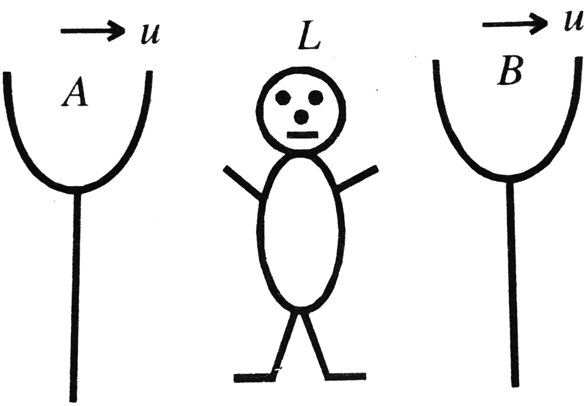
21. 

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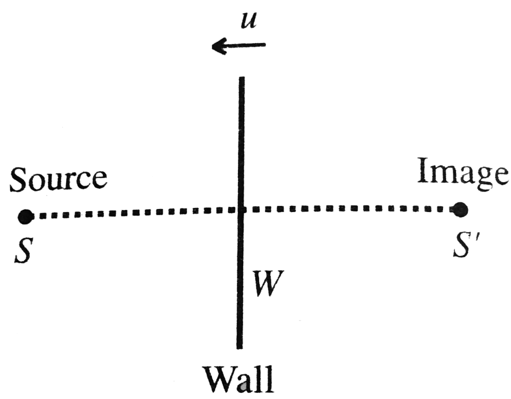

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Watch Video Solution

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Watch Video Solution

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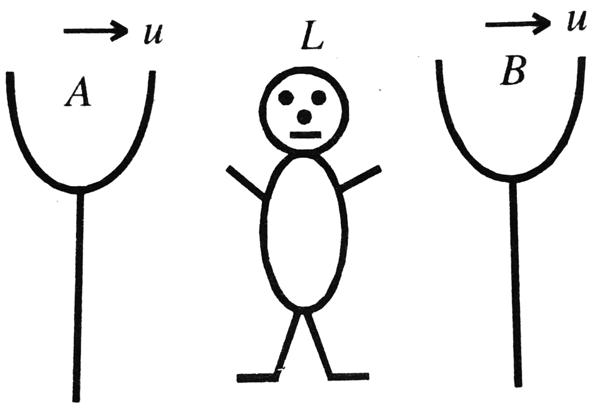
35. 

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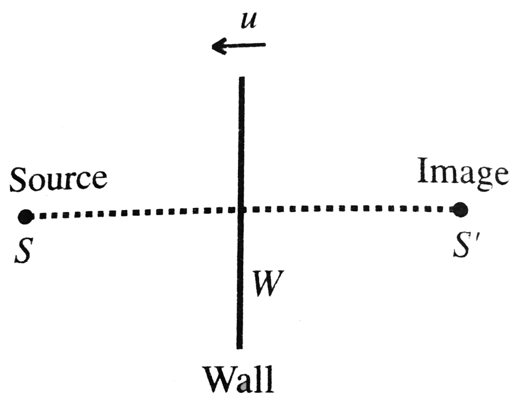

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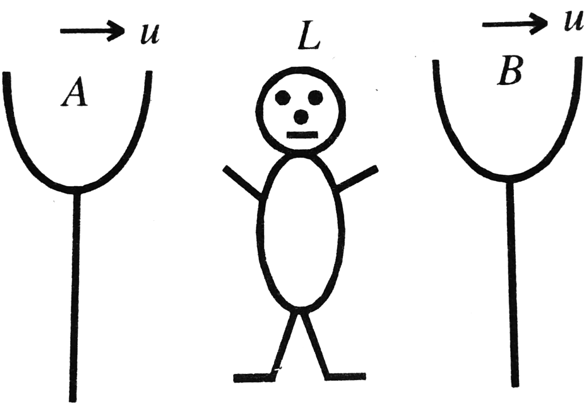
49. 

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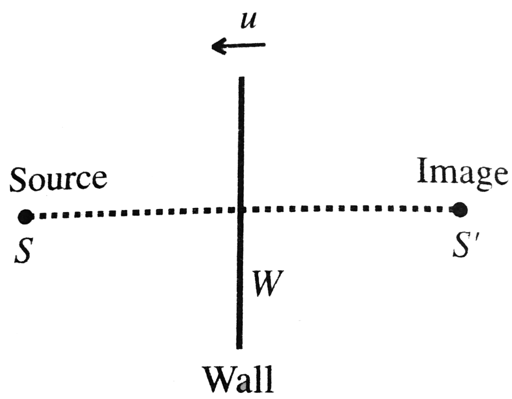

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Single Correct

1. A man is watching two trains, one leaving and the other coming in with equal speed of $4 m / s$. If they sound their whistles, each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air is $320 m / s$ will be equal to

A. 6

B. 3

C. 0

D. 12

Answer: A

Watch Video Solution

2. The intensity of a sound wave gets reduced by 20% on passing through a slab. The reduction in intensity on passing through two such consecutive slabs is

A. 40%

B. 36%

C. 30%

D. 50 %

Answer: B

Watch Video Solution

3. Two factories are sounding their sirens at 800 Hz. A man goes from one factory to the other at a speed of 2 m/s. The velocity of sound is 320 m/s. The number of beats heard by the person is 1 s will be

A. 2

B. 4

C. 8

D. 10

Answer: D

Watch Video Solution

4. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u

so that he hears 10 beats per second?

A. $2.0\frac{m}{s}$

B. $2.5\frac{m}{s}$

C. $30\frac{m}{s}$

D. $3.5\frac{m}{s}$

Answer: B

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5. A train has just completed a U-curve in a trach which is a semi circle. The engine is at the forward end of the semi circular part of the trach while the last carriage is at the rear end of the semi circular track. The driver blows a whistle of frequency 200 Hz. Velocity of sound is $340\frac{m}{s}$. Then the apparent frequency as observed by a passenger in the middle of the train, when the speed of the train is 30 m/s, is

A. 219 Hz

B. 188 Hz

C. 200 Hz

D. 181 Hz

Answer: C

Watch Video Solution

6. One train is approaching an observer at rest and another train is receding from him with the same velocity $4m/s$. Both trains blow whistles of same frequency of $243H_Z$. The beat frequency in H_Z as heard by observer is

(speed of sound in air = $320 m / s$)

A. 10

B. 6

C. 4

D. 1

Answer: B

Watch Video Solution

7. Two sound sources are moving in opposite directions with velocities v_1 and $v_2 \left(v_1 > v_2\right)$. Both are moving away from a stationary observer. The frequency of both the sources is 900 Hz. What is the value of v_1 - v_2 so that the beat frequency observed by the observer is 6 Hz? Speed of sound $v = 300\frac{m}{s}$. Given that v_1 and $v_2 < \ < \ < v$.

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

B. $2\frac{m}{s}$

C. $3\frac{m}{s}$

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

Answer: B

Watch Video Solution

8. The frequency changes by 10% as the source approaches a stationary observer with constant speed v_S, What sould be the percentage change in ferquency as the source recedes from the observer with the same speed? Given that $v_S << v$ (v speed of sound in air).

A. 14.3 %

B. 20 %

C. 16.7 %

D. 10 %

Answer: D

Watch Video Solution

9. Speed of sound wave is v. If a reflector moves towards a stationary source emitting waves of frequency f with speed u, the wavelength of reflected waves will be

A. $\frac{v - u}{v + u} f$

B. $\frac{v + u}{v} f$

C. $\frac{v + u}{v - u} f$

D. $\frac{v - u}{v} f$

Answer: C

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10. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. $1.2f$ and λ

B. f and 1.2λ

C. 0.8 and 0.8λ

D. $1.2f$ and 1.2λ

Answer: A

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11. A sound source is moving with speed $50m/s$ towards a fixed observer. Frequency observed by observer is $1000Hz$. Find out apparent frequency observed by observer when source is moving away from observer (Speed of sound $= 350 m/s$)

A. 750 Hz

B. 857 Hz

C. 1143 Hz

D. 1333 Hz

Answer: A

Watch Video Solution

12. A whistle emitting a sound of frequency $440h_z$ is tied to a string of $1.5m$ length and roated with an angular velocity of $20rad/s$ in the horizontal plane. Calculate the range of frequencies heard by an observer stationed at a larger distance from the whistle .(Speed of sound =$330m/s$) .

A. 400.0 Hz to 484.0 Hz

B. 403.3 Hz to 480.0 Hz

C. 400.0 Hz to 480.0 Hz

D. 403.3 Hz to 484.0 Hz

Answer: D

Watch Video Solution

13. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an expression for the beat frequency heard by the motorist.

A. $\dfrac{v + v_m}{v + v_b} f$

B. $\dfrac{v + v_m}{v - v_b} f$

C. $\dfrac{2v_b\left(v + v_m\right)}{v^2 - v_b^2} f$

D. $\dfrac{2v_m\left(v + v_b\right)}{v^2 - v_m^2} f$

Answer: C

Watch Video Solution

14. A man standing on a platform hears the sound of frequency 604 Hz coming from a frequency 550 Hz from a train whistle moving towards the platform. If the velocity of sound is 330 m/s, then what is the speed of train?

A. $30\frac{m}{s}$

B. $35\frac{m}{s}$

C. $40\frac{m}{s}$

D. $45\frac{m}{s}$

Answer: A

Watch Video Solution

15. A vehicle , with a horn of frequency n is moving with a velocity of $30m/s$ in a direction prependicular to the straight line joining the observer and the vehicle . The observer perceives the sound to have a grequency $\left(n+n_1\right)$. If the sound velocity in air is $330m/s$, then

A. $n_1 = 10n$

B. $n_1 = -n$

C. $n_1 = 0.1n$

D. $n_1 = 0$

Answer: D

Watch Video Solution

16. An isotropic stationary source is emitting waves of frequency n and wind is blowing due north. An observer A is on north of the source while observer B is on south the source. IF both the observers are stationary, then

A. frequency received by A is greater than n

B. frequency received by B is less than n

C. freqeuency received by A equals to that received by B

D. frequencies received by A and B cannot be calculated unless velocity of waves in still air and velcity of wind are known

Answer: C

Watch Video Solution

17. A train is moving with a constant speed along a circular track. The engine of the train emits a sound of frequency f. The frequency heard by the guard at the rear end of the train.

A. is less than f

B. is greater than f

C. is equal to f

D. may be greater than less than or equal to f depending on factors like speed of

train, length of train and radius of circular track.

Answer: C

Watch Video Solution

18. 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. 5 %

B. 20 %

C. 0 %

D. 0.5 %

Answer: B

Watch Video Solution

19. An increase in intensity level of 1 dB implies an increase in density of (given anti $\log_{10} 0.1 = 1.2589$)

A. 1%

B. 3.01%

C. 26%

D. 0.1%

Answer: C

Watch Video Solution

20. In expressing sound intensity we take $10^{-12}\frac{W}{m^2}$ as the reference level. For ordinary

conversation the intensity level is about $10^{-6}\frac{W}{m^2}$. Expressed in decibel, this is

A. 10^6

B. 6

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

21. The intensity level of two sounds are 100 dB and 50 dB. What is the ratio of their intensities?

A. 10^{1}

B. 10^{3}

C. 10^{5}

D. 10^{10}

Answer: C

Watch Video Solution

22. An engine running at speed $\frac{v}{10}$ sounds a whistle of frequency 600 Hz. A passenger in a train coming from the oppsite side at speed of $\frac{v}{15}$ experiences this whistle to be of frequency f. If v is speed of sound in air and there is no wind. F is nearest to

A. 711 Hz

B. 630 Hz

C. 580 Hz

D. 510 Hz

Answer: A

Watch Video Solution

23. A source of sound produces waves of wavelength 60 cm when it is stationary if the speed of sound in air is $320\frac{m}{s}$ and source moves with speed $20\frac{m}{s}$, the wavelength of sound in the forward direction will be nearest to

A. 56 cm

B. 60 cm

C. 64 cm

D. 68 cm

Answer: A

Watch Video Solution

24. The apparent frequency of the whistle of an engine changes in the ratio 6:5 as the engine passes a stationary observer. If the

velocity of sound is $330\frac{m}{s}$, then the velocity of the engine is

A. $3\frac{m}{s}$

B. $30\frac{m}{s}$

C. $0.33\frac{m}{s}$

D. $660\frac{m}{s}$

Answer: B

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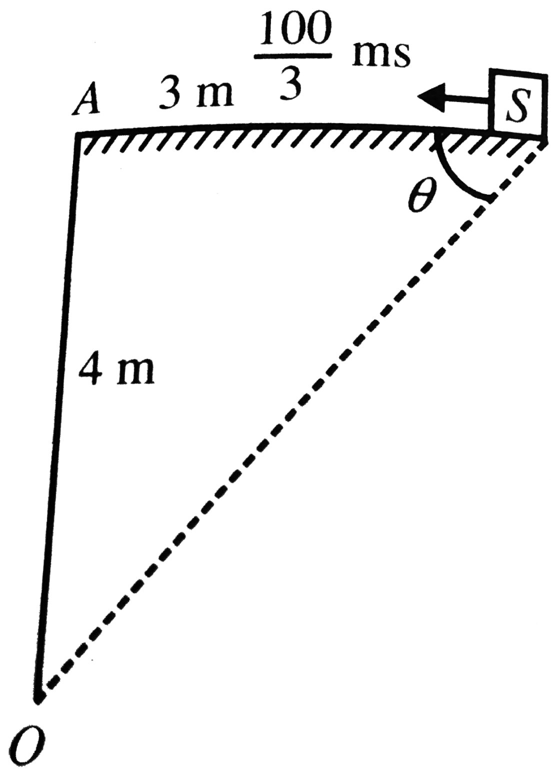

25.

A source of sound S is travelling at $\frac{100}{3}\frac{m}{s}$ along a road, towards a point A. When the source is 3 m away from A, a person standint at a point O on a road perpendicular to AS

hears a sound of requency v'. The distance of O from A at that time is 4 m. If the original frequency is 640 Hz, then the value of v' is (velocity of sound is $340\frac{m}{s}$)

A. 620 Hz

B. 680 Hz

C. 720 Hz

D. 840 Hz

Answer: B

Watch Video Solution

26. A source of sound is travelling with a velocity of $30\frac{m}{s}$ towards a stationary observer. If actual frequency of source is 1000 Hz and the wind is blowing with velocity $20\frac{m}{s}$ in a direction at $60\,^{\circ}C$ with the direction of motion of source, then the apparent frequency heard by observer is (speed of sound is $340\frac{m}{s}$)

A. 1011 Hz

B. 1000 Hz

C. 1094 Hz

D. 1086 Hz

Answer: C

Watch Video Solution

27. A source of sound emits $200\pi W$ power which is uniformly distributed over a sphere of radius 10 m. What is the loudness of sound on the surface of the sphere?

A. 70 dB

B. 107 dB

C. 80 dB

D. 117 dB

Answer: D

Watch Video Solution

28. Two cars are moving on two perpendicular roads towards a crossing with uniform speeds

of $72\frac{km}{h}$ and $36\frac{km}{h}$. If second car blows born of frequency 280 Hz, then the frequency of horn heard by the driver of first car when the line joining the cars makes angle of $45\,^{\circ}C$ with the roads, will be (velocity of sound is $330\frac{m}{s}$)

A. 321 Hz

B. 298 Hz

C. 289 Hz

D. 280 Hz

Answer: B

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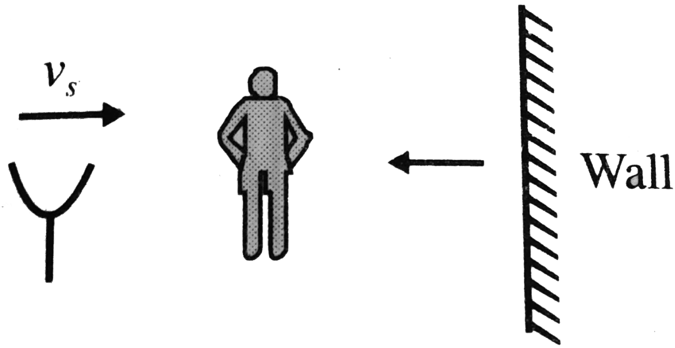

29.

A tuning fork of frequency 380 Hz is moving towards a wall with a velocity of $4\frac{m}{s}$ Then the number of beats heard by a stationary listener between direct and reflected sound will be (velocity of sound in air is $340\frac{m}{s}$)

A. 0

B. 5

C. 7

D. 10

Answer: A

Watch Video Solution

30.

A sound wave of frequency n travels horizontally to the right with speed with speed c. It is reflected from a broad wall moving to the left with speed v. The number of beats heard by a stationary observer to the left of the wall is

A. zero

B. $\frac{n(c+v)}{c-v}$

C. $\frac{nv}{c-v}$

D. $\frac{2nv}{c-v}$

Answer: D

Watch Video Solution

31. A boy is walking away from a well at a speed of $1.0 m/s$ in a direction at right angles to the wall. As he walks, he below a whistle steadily. An observer towards whom the boy is walking hears 4.0 beats per second. If the speed of sound is $340 m/s$, what is the frequency of the whistle?

A. 480 Hz

B. 680 Hz

C. 840 Hz

D. 1000 Hz

Answer: B

Watch Video Solution

32. A source emitting a sound of frequency v is placed at a large distance from an observer. The source starts moving towards the observer with a uniform acceleration a. Find the frequency heard by the observer corresponding to the wave emitted just after the source starts. The speed of sound in the medium is v.

A. $\dfrac{vf^2}{2vf - a}$

B. $\dfrac{2vf^2}{2vf + a}$

C. $\dfrac{2vf^2}{3vf - a}$

D. $\dfrac{2vf^2}{2vf - a}$

Answer: D

Watch Video Solution

33. Due to a point isotropic sonic source, loudness at a point is $L = 60dB$ If density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $v = 33\frac{m}{s}$, the pressure oscillation amplitude at the point of observation is $\left[I_0 = 10^{-12}\frac{W}{m^2}\right]$

A. $0.3\frac{N}{m^2}$

B. $0.03\frac{N}{m^2}$

C. $3 \times 10^{-3}\frac{N}{m^2}$

D. $3 \times 10^{-4}\frac{N}{m^2}$

Answer: B

Watch Video Solution

34. The frequency of a car horm is 400 Hz. If the horn is honked as the car moves with a

speed $u_S = 34\frac{m}{s}$ through still air towards a stationary receiver, the wavelength of the sound passing the receiver is [velocity of sound is $340\frac{m}{s}$]

A. 0.765 m

B. 0.850 m

C. 0.935 m

D. 0.425 m

Answer: A

Watch Video Solution

35. Spherical sound waves are emitted uniformly in all direction from a point source. The variation in sound level SL. As a function of distance r from the source can be written as where a and b are positive constants.

A. $SL = -b\log r^{a}$

B. $SL = a - b(\log r)^{2}$

C. $SL = a - b\log r$

D. $SL = \frac{a-b}{r^{2}}$

Answer: C

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36. When a person wears a hearing aid, the sound intensity level increases by 30 dB. The sound intensity increases by

A. e^2

B. 10^3

C. 30

D. 10^2

Answer: B

Watch Video Solution

37. A motorcycle starts from rest and accelerates along a straight line at $2.2\frac{m}{s^2}$. The speed of sound is $330\frac{m}{s}$. A siren at the starting point remains stationary. When the driver hears the frequency of the siren at 90% of when motorcycle is stationary, the distance travelled by the motorcyclist is

A. `123.75 m

B. 247.5 m

C. 495 m

D. 990 m

Answer: B

Watch Video Solution

38. The difference in the speeds of sound in air at -$5^{\circ} C$, 60 cm pressure of mercury and $30^{\circ} C$

, 75 cm pressure of mercury is (velocity of sound in air at $0^{\circ}C$ is $332\frac{m}{s}$)

A. $15.25\frac{m}{s}$

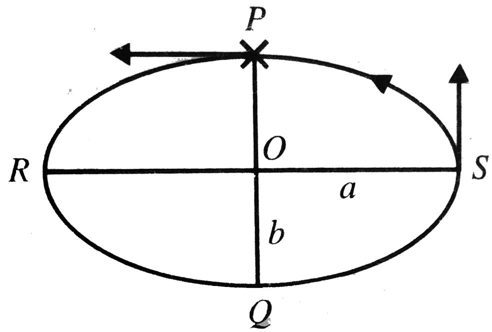
B. $21.35\frac{m}{s}$

C. $18.3\frac{m}{s}$

D. $3.05\frac{m}{s}$

Answer: B

Watch Video Solution



39.

A train is moving in an elliptical orbit in anticlockwise sense with a speed of $110\frac{m}{s}$. Guard is also moving in the given direction with same speed as that of train. The ratio of the length of major and minor axes is $\frac{4}{3}$. Driver blows a whistle of 1900 Hz at P, which is

received by guard at S. The frequency received by guard is (velocity of sound $v = 330\frac{m}{s}$)

A. 1900 Hz

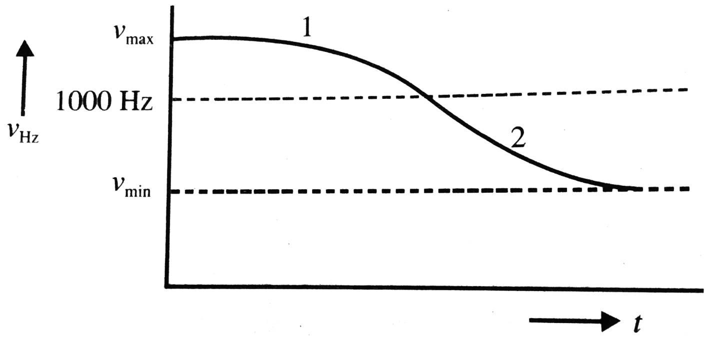
B. 1800 Hz

C. 2000 Hz

D. 1500 Hz

Answer: B

Watch Video Solution



40.

A stationary observer receives a sound from a sound of freqeuency ν_0 moving with a constant velocity $v_S = 30\frac{m}{s}$ The apparent frequency varies with time as shown in figure. Velocity of sound $v = 300\frac{m}{s}$. Then which of the following is incorrect?

A. The minimum value of apparent frequency is 889 Hz

B. The natural frequency of souce is 1000 Hz

C. The frequency time curve corresponds to a source moving at an angle to the stationary observer.

D. The maximum value of apparent frequency is 1111 Hz

Answer: A

Watch Video Solution

41. The sound from a very high burst of fireworks takes 5 s to arrive at the observer. The burst occurs 1662 m above the observer and travels vertically through two stratifier layers of air, the top one of thickness d_1 at $0^\circ C$ and the bottom one of thickness d_2 at $20^\circ C$. Then (assume velocity of sound at $0^\circ C$ is $330\frac{m}{s}$)

A. $d_1 = 342m$

B. $d_2 = 1320m$

C. $d_1 = 1485m$

D. $d_2 = 342m$

Answer: A

Watch Video Solution

42. A car emitting sound of frequency 500 Hz speeds towards a fixed wall at $4\frac{m}{s}$. An observer in the car hears both the source frequency as well as the frequency of sound reflected from

the wall. If he hears 10 beats per second between the two sounds, the velocity of sound in air will be

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

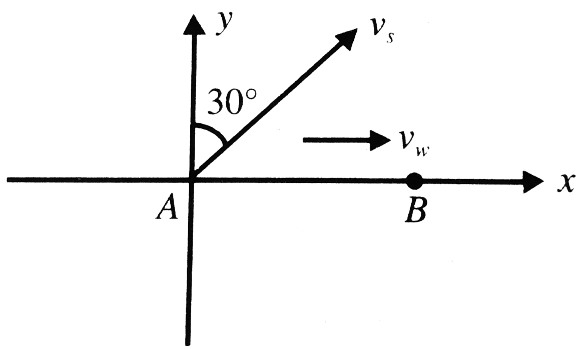
B. $387\frac{m}{s}$

C. $404\frac{m}{s}$

D. $340\frac{m}{s}$

Answer: D

Watch Video Solution



43.

In the figure shown, a source of sound of frequency 510 Hz moves with constant velocity $v_S = 20\frac{m}{s}$ in the direction shown. The wind is blowing at a constant velocity $v_W = 20\frac{m}{s}$ towards an observer who is at rest at point B. corresponding to the sound emitted by the source at initial position A, the frequency

detected by the observer is equal to (speed of sound relative to air is $330\frac{m}{s}$)

A. 510 Hz

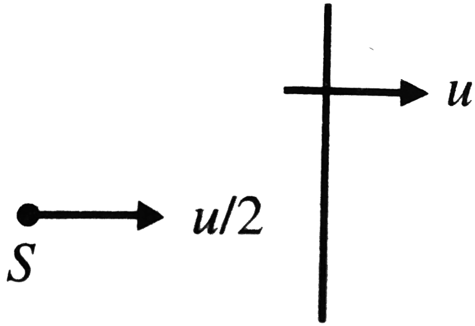
B. 500 Hz

C. 525 Hz

D. 550 Hz

Answer: C

Watch Video Solution



44.

A wall is moving with velocity u and a source of sound moves with velocity $\frac{u}{2}$ in the same direction as shown in the figure. Assuming that the sound travels with velocity $10u$, the ratio of incident sound wavelength on the wall to the reflected sound wavelength by the wall is equal to

A. $9:11$

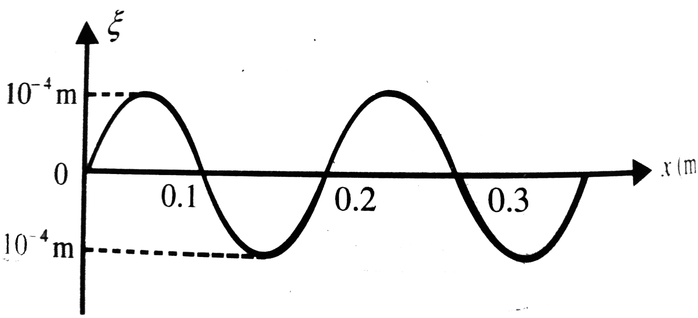
B. $11:9$

C. $4:5$

D. $5:4$

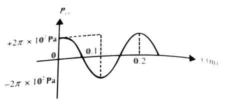
Answer: C

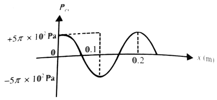
Watch Video Solution

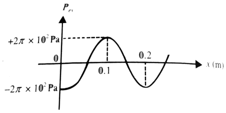


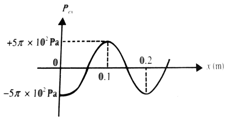
45.

For a sound wave travelling towards $+x$ direction, sinusoidal longitudinal displacement ε at a certain time is given as a function of x (Fig). If bulk modulus of air is $B = 5 \times 10^5 \frac{N}{m^2}$, the variation of pressure excess will be

A. a. 

B. b. 

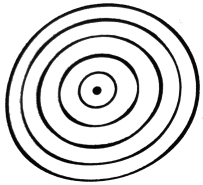
C. c. 

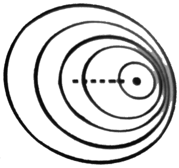
D. d. 

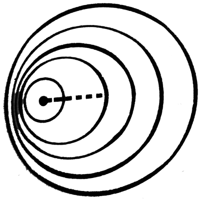
Answer: A

Watch Video Solution

46. If the source is moving towards right, wavefront of sound waves get modifies to

A. 

B. 

C. 

D. none of these

Answer: D

Watch Video Solution

47. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $f_1 \neq f_2 \neq f_3$

B. $f_1 < f_2$

C. $f_3 < f_0$

D. $f_1 < f_3 < f_2$

Answer: B

Watch Video Solution

48. When source and detector are stationary but the wind is blowing at speed v_W, the apparent wavelength λ' on the wind side is related to actual wavelength λ by [take speed of sound is air as v]

A. $\lambda' = \lambda$

B. $\lambda' = \dfrac{v_W}{v}\lambda$

C. $\lambda' = \dfrac{v_W + v}{v}\lambda$

D. $\lambda' = \dfrac{v}{v - v_W}\lambda$

Answer: C

Watch Video Solution

49.

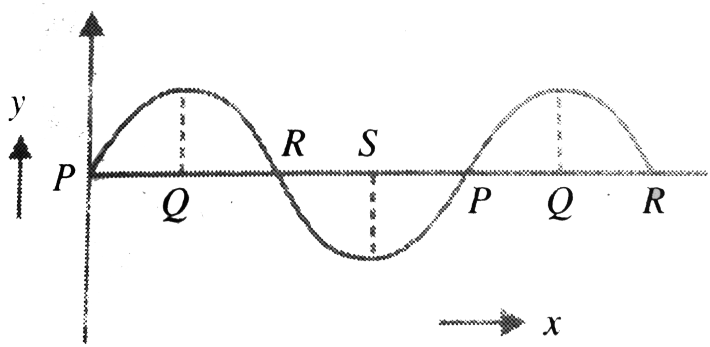


Figure. Represents the displacement y versus distance x along the direction of propagation of a longitudinal wave. The pressure is maximum at position marked

A. P

B. Q

C. R

D. S

Answer: C

Watch Video Solution

50. The driver of a car approaching a vertical wall notices that the frequency of the horn of his car changes from 400 Hz to 450 Hz after being reflected from the wall. Assuming speed of sound to be $340\frac{m}{s}$, the speed of approach of car towards the wall is

A. $10\frac{m}{s}$

B. $20\frac{m}{s}$

C. $30\frac{m}{s}$

D. $40\frac{m}{s}$

Answer: C

Watch Video Solution

51. The difference between the apparent frequency of a sound of sound as perceived by an observer during its approach and recession

is 2% of the natural frequency of the source.

If the velocity of sound in air is $300 m/s$, the velocity of the source is (It is given that velocity of source $< <$ velocity of sound)

A. $1.5\frac{m}{s}$

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

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

D. $12\frac{m}{s}$

Answer: B

Watch Video Solution

52. The frequency of a radar is 780 MHz. After getting reflected from an approaching aeroplane, the apparent frequency is more than the actual frequency by 2.6 kHz. The aeroplane has a speed of

A. $2\frac{km}{s}$

B. $1\frac{km}{s}$

C. $0.5\frac{km}{s}$

D. $0.25\frac{km}{s}$

Answer: B

Watch Video Solution

53. 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 train's speed is reduced to $17 m/s$, the frequency registered is f_2. If the speed of sound of $340 m/s$, then the ratio f_1/f_2 is

A. $\frac{18}{19}$

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

C. 2

D. $\frac{19}{18}$

Answer: C

Watch Video Solution

54. A siren placed at a railway platform is emitting sound of frequency $5kHz$. A passenger sitting in a moving train A records

a frequency of $5.5 kHz$ while the train approaches the siren. During his return journey in a different train B he records a frequency of $6.0 kHz$ while approaching the same siren. the ratio the velocity of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $\frac{5}{6}$

D. $\frac{11}{6}$

Answer: D

Watch Video Solution

55. A person speaking normally produces a sound intensity of $40 dB$ at a distance of $1 m$. If the threshold intensity for reasonable audibility is $20 dB$, the maximum distance at which he can be heard cleary is.

A. 4 m

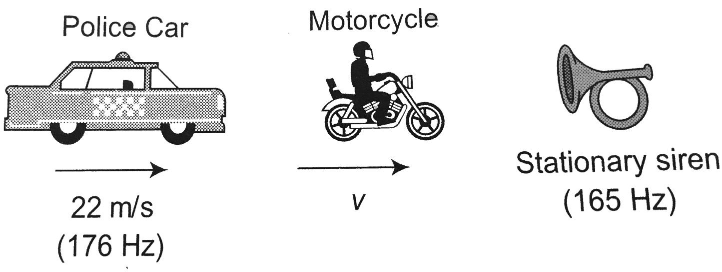
B. 5 m

C. 10 m

D. 20 m

Answer: B

Watch Video Solution

56. 

A police car moving at $22 m/s$, chases a motorcyclist, the police man sounds his horn at $176 Hz$, while both of them move towards a stationary siren of frequency $165 Hz$. Calculate

the speed of the motorcycle, if it is given that he does not observes any beat

A. $33\frac{m}{s}$

B. $22\frac{m}{s}$

C. $11\frac{m}{s}$

D. zero

Answer: C

Watch Video Solution

57. In sport meet the timing of a 200 m straight dash is recorded at the finish point by starting an accurate stop watch on hearing the sound of starting gun firen at the starting poing. The time recorded will be more accurate

A. In winter

B. in summer

C. in all seasons

D. none of these

Answer: B

Watch Video Solution

58. When a source moves away from a stationary observer, the frequency is $\frac{6}{7}$ times the original frequency. Given: speed of sound $= 330\frac{m}{s}$. The speed of the source is

A. $40\frac{m}{s}$

B. $55\frac{m}{s}$

C. $330\frac{m}{s}$

D. $165\frac{m}{s}$

Answer: B

Watch Video Solution

59. Length of a string of density ρ and Young's modulus Y under tension is increased by $\frac{1}{n}$ times of its original length If the velocity of transverse and longitudinal vibration of the string is same, find the value of such velocity.

A. $\sqrt{\frac{Y}{\rho n}}$

B. $\sqrt{\frac{Y}{\rho n^{\frac{1}{2}}}}$

C. $\sqrt{\frac{Y}{\rho}}$

D. $\sqrt{\frac{Y}{\rho n^{\frac{3}{2}}}}$

Answer: B

Watch Video Solution

60. Source and observer start moving simulatneously along x and y-axis respectively. The speed of source is twice the speed of observer V_0. If the ratio of observer frequency to the frequency of the source is 0.75, find the velocity of sound.

A. $\frac{11}{\sqrt{5}} V_0$

B. $\frac{17}{\sqrt{5}} V_0$

C. $\frac{16}{\sqrt{5}} V_0$

D. $\frac{19}{\sqrt{5}} V_0$

Answer: C

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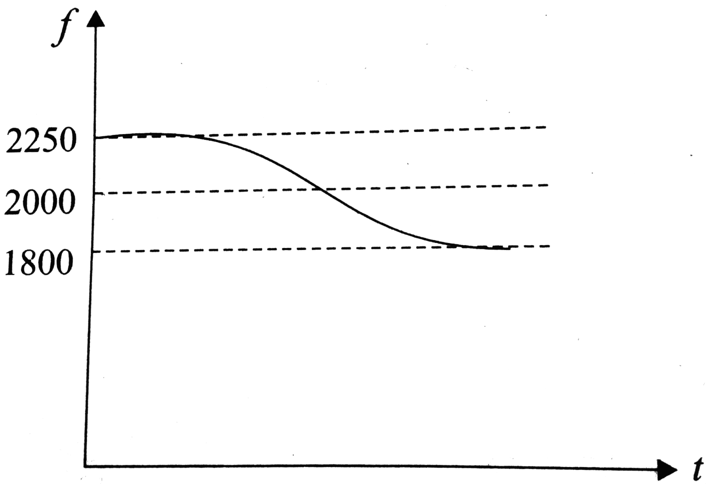


61.

A statinary observer receives a sound of frequency 2000 Hz. The variation of apparent

frequency and time is shown. Find the speed of source, if velocity of sound is $300\frac{m}{s}$

A. $66.6\frac{m}{s}$

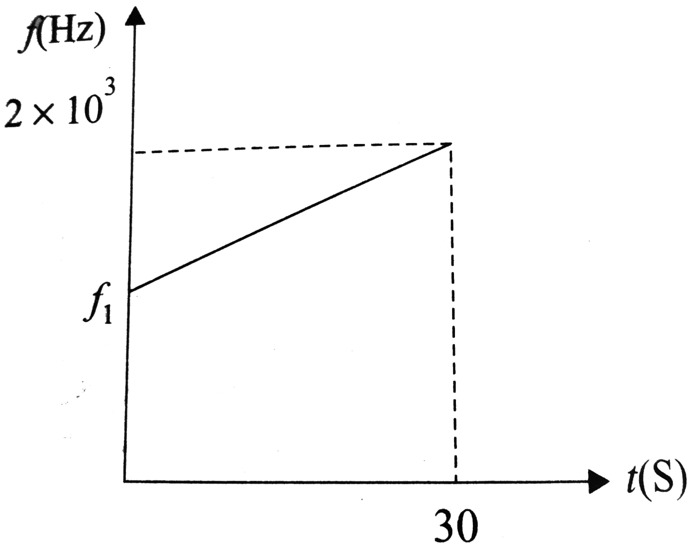
B. $33.3\frac{m}{s}$

C. $27.3\frac{m}{s}$

D. $59.3\frac{m}{s}$

Answer: B

Watch Video Solution



62.

A source of sound of frequency f_1 is placed on the ground. A detector placed at a height is released from rest on this source. The observed frequency $f(Hz)$ is plotted against time $t(\text{sec})$. The speed of sound in air is $300\frac{m}{s}$.

Find f_1 $(g = 10\frac{m}{s})$.

A. $0.5 \times 10^3 Hz$

B. $2 \times 10^3 Hz$

C. $0.25 \times 10^3 Hz$

D. $0.2 \times 10^3 Hz$

Watch Video Solution

63. 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 number of wave striking the surface per second is $\frac{f((c+v))}{c}$

B. The wavelength of reflected wave is $\frac{c(c-v)}{f(c+v)}$

C. The frequency of reflected wave is $\frac{f(c+v)}{c-v}$

D. The number of beats heard by a stationary listener to the left to the

reflecting surface is $\frac{vf}{(c - v)}$

Watch Video Solution

64. A man is watching two trains, one leaving and the other coming in with equal speed of 4 m/s. If they sound their whistles, each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air is $320\frac{m}{s}$) will be equal to

A. 6

B. 3

C. 0

D. 12

Answer: A

Watch Video Solution

65. The intensity of a sound wave gets reduced by 20% on passing through a slab. The reduction intensity on passage through two such consecutive slabs

A. 40 %

B. 36 %

C. 30 %

D. 50 %

Answer: B

Watch Video Solution

66. Two factories are sounding their sirens at 800 Hz. A man goes from one factory to the other at a speed of 2 m/s. The velocity of sound is 320 m/s. The number of beats heard by the person is 1 s will be

A. 2

B. 4

C. 8

D. 10

Answer: D

Watch Video Solution

67. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. $2.0\frac{m}{s}$

B. $2.5\frac{m}{s}$

C. $30\frac{m}{s}$

D. $3.5\frac{m}{s}$

Answer: B

Watch Video Solution

68. A train has just completed a U-curve in a trach which is a semi circle. The engine is at the forward end of the semi circular part of the trach while the last carriage is at the rear end of the semi circular track. The driver blows a whistle of frequency 200 Hz. Velocity of

sound is $340\frac{m}{s}$. Then the apparent frequency as observed by a passenger in the middle of the train, when the speed of the train is 30 m/s, is

A. 219 Hz

B. 188 Hz

C. 200 Hz

D. 181 Hz

Answer: C

Watch Video Solution

69. One train is approaching an observer at rest and another train is receding from him with the same velocity $4 m/s$. Both trains blow whistles of same frequency of $243 H_Z$. The beat frequency in H_Z as heard by observer is (speed of sound in air = $320 m/s$)

A. 10

B. 6

C. 4

D. 1

Answer: B

Watch Video Solution

70. Two sound sources are moving in opposite directions with velocities v_1 and $v_2 \left(v_1 > v_2\right)$. Both are moving away from a stationary observer. The frequency of both the sources is 900 Hz. What is the value of $v_1 - v_2$ so that the beat frequency observed by the observer is 6 Hz? Speed of sound $v = 300\frac{m}{s}$. Given that v_1 and $v_2 < \, < \, < v$.

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

B. $2\frac{m}{s}$

C. $3\frac{m}{s}$

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

Answer: B

Watch Video Solution

71. The frequency changes by 10% as the source approaches a stationary observer with constant speed v_S, What sould be the

percentage change in ferquency as the source recedes from the observer with the same speed? Given that $v_S < < v$ (v speed of sound in air).

A. $14.3\ \%$

B. $20\ \%$

C. $16.7\ \%$

D. $10\ \%$

Answer: D

Watch Video Solution

72. Speed of sound wave is v. If a reflector moves towards a stationary source emitting waves of frequency f with speed u, the wavelength of reflected waves will be

A. $\frac{v - u}{v + u}f$

B. $\frac{v + u}{v}f$

C. $\frac{v + u}{v - u}f$

D. $\frac{v - u}{v}f$

Answer: C

Watch Video Solution

73. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. $1.2f$ and λ

B. f and 1.2λ

C. 0.8 and 0.8λ

D. $1.2f$ and 1.2λ

Answer: A

Watch Video Solution

74. 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 $350 m/s$

A. 750 Hz

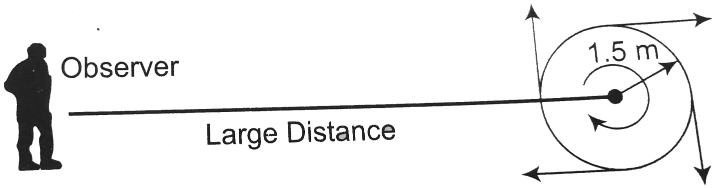
B. 857 Hz

C. 1143 Hz

D. 1333 Hz

Answer: A

Watch Video Solution

75. 

A whistle emitting a sound of frequency $440 Hz$ is tied to string of $1.5 m$ length and rotated with an angular velocity of $20 rad/\sec$ in the horizontal plane. Then the range of frequencies heard by an observer stationed at a large distance from the whistle will $(v = 330 m/s)$

A. 400.0 Hz to 484.0 Hz

B. 403.3 Hz to 480.0 Hz

C. 400.0 Hz to 480.0 Hz

D. 403.3 Hz to 484.0 Hz

Answer: D

Watch Video Solution

76. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an

expression for the beat frequency heard by the motorist.

A. $\dfrac{v + v_m}{v + v_b} f$

B. $\dfrac{v + v_m}{v - v_b} f$

C. $\dfrac{2v_b\left(v + v_m\right)}{v^2 - v_b^2} f$

D. $\dfrac{2v_m\left(v + v_b\right)}{v^2 - v_m^2} f$

Answer: C

Watch Video Solution

77. A man standing on a platform hears the sound of frequency 604 Hz coming from a frequency 550 Hz from a train whistle moving towards the platform. If the velocity of sound is 330 m/s, then what is the speed of train?

A. $30\frac{m}{s}$

B. $35\frac{m}{s}$

C. $40\frac{m}{s}$

D. $45\frac{m}{s}$

Answer: A

Watch Video Solution

78. A vehicle , with a horn of frequency n is moving with a velocity of $30m/s$ in a direction perpendicular to the straight line joining the observer and the vehicle . The observer perceives the sound to have a frequency $(n+n_1)$. If the sound velocity in air is $330m/s$, then

A. $n_1 = 10n$

B. $n_1 = -n$

C. $n_1 = 0.1n$

D. $n_1 = 0$

Answer: D

Watch Video Solution

79. An isotropic stationary source is emitting waves of frequency n and wind is blowing due north. An observer A is on north of the source while observer B is on south the source. IF both the observers are stationary, then

A. frequency received by A is greater than n

B. frequency received by B is less than n

C. freqeuency received by A equals to that received by B

D. frequencies received by A and B cannot be calculated unless velocity of waves in still air and velcity of wind are known

Answer: C

Watch Video Solution

80. A train is moving with a constant speed along a circular track. The engine of the train emits a sound of frequency f. The frequency heard by the guard at the rear end of the train.

A. is less than f

B. is greater than f

C. is equal to f

D. may be greater than less than or equal to f depending on factors like speed of

train, length of train and radius of circular track.

Answer: C

Watch Video Solution

81. 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. 5 %

B. 20 %

C. 0 %

D. 0.5 %

Answer: B

Watch Video Solution

82. An increase in intensity level of 1 dB implies an increase in intensity of (given anti $\log_{10} 0.1 = 1.2589$)

A. $1\ \%$

B. $3.01\ \%$

C. $26\ \%$

D. $0.1\ \%$

Answer: C

Watch Video Solution

83. In expressing sound intensity we take $10^{-12}\frac{W}{m^2}$ as the reference level. For ordinary

conversation the intensity level is about $10^{-6}\frac{W}{m^2}$. Expressed in decibel, this is

A. 10^6

B. 6

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

84. The intensity level of two sounds are 100 dB and 50 dB. What is the ratio of their intensities?

A. 10^1

B. 10^3

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

85. An engine running at speed $\frac{v}{10}$ sounds a whistle of frequency 600 Hz. A passenger in a train coming from the oppsite side at speed of $\frac{v}{15}$ experiences this whistle to be of frequency f. If v is speed of sound in air and there is no wind. F is nearest to

A. 711 Hz

B. 630 Hz

C. 580 Hz

D. 510 Hz

Answer: A

Watch Video Solution

86. A source of sound produces waves of wavelength 60 cm when it is stationary if the speed of sound in air is $320\frac{m}{s}$ and source moves with speed $20\frac{m}{s}$, the wavelength of sound in the forward direction will be nearest to

A. 56 cm

B. 60 cm

C. 64 cm

D. 68 cm

Answer: A

Watch Video Solution

87. The apparent frequency of the whistle of an engine changes in the ratio 6:5 as the engine passes a stationary observer. If the

velocity of sound is $330\frac{m}{s}$, then the velocity of the engine is

A. $3\frac{m}{s}$

B. $30\frac{m}{s}$

C. $0.33\frac{m}{s}$

D. $660\frac{m}{s}$

Answer: B

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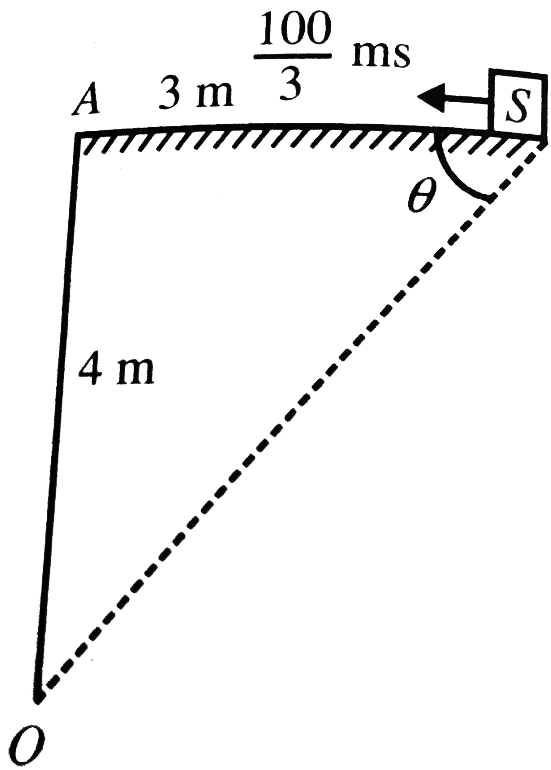


88.

A source of sound S is travelling at $\frac{100}{3}\frac{m}{s}$ along a road, towards a point A. When the source is 3 m away from A, a person standint at a point O on a road perpendicular to AS

hears a sound of requency v'. The distance of O from A at that time is 4 m. If the original frequency is 640 Hz, then the value of v' is

(velocity of sound is $340\frac{m}{s}$)

A. 620 Hz

B. 680 Hz

C. 720 Hz

D. 840 Hz

Answer: B

Watch Video Solution

89. A source of sound is travelling with a velocity of $30\frac{m}{s}$ towards a stationary observer. If actual frequency of source is 1000 Hz and the wind is blowing with velocity $20\frac{m}{s}$ in a direction at $60^{\circ}C$ with the direction of motion of source, then the apparent frequency heard by observer is (speed of sound is $340\frac{m}{s}$)

A. 1011 Hz

B. 1000 Hz

C. 1094 Hz

D. 1086 Hz

Answer: C

Watch Video Solution

90. A source of sound emits $200\pi W$ power which is uniformly distributed over a sphere of radius 10 m. What is the loudness of sound on the surface of the sphere?

A. 70 dB

B. 107 dB

C. 80 dB

D. 117 dB

Answer: D

Watch Video Solution

91. Two cars are moving on two perpendicular roads towards a crossing with uniform speeds

of $72\frac{km}{h}$ and $36\frac{km}{h}$. If second car blows horn of frequency 280 Hz, then the frequency of horn heard by the driver of first car when the line joining the cars makes angle of $45^{\circ}C$ with the roads, will be (velocity of sound is $330\frac{m}{s}$)

A. 321 Hz

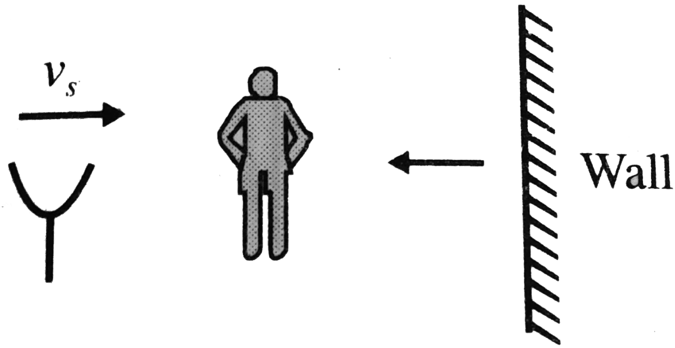
B. 298 Hz

C. 289 Hz

D. 280 Hz

Answer: B

Watch Video Solution



92.

A tuning fork of frequency 380 Hz is moving towards a wall with a velocity of $4\frac{m}{s}$ Then the number of beats heard by a stationary listener between direct and reflected sound will be (velocity of sound in air is $340\frac{m}{s}$)

A. 0

B. 5

C. 7

D. 10

Answer: A

Watch Video Solution

93.

A sound wave of frequency n travels horizontally to the right with speed with speed c. It is reflected from a broad wall moving to the left with speed v. The number of beats heard by a stationary observer to the left of the wall is

A. zero

B. $\frac{n(c+v)}{c-v}$

C. $\frac{nv}{c-v}$

D. $\frac{2nv}{c-v}$

Answer: D

Watch Video Solution

94. A boy is walking away from a well at a speed of $1.0 m/s$ in a direction at right angles to the wall. As he walks, he below a whistle steadily. An observer towards whom the boy is walking hears 4.0 beats per second. If the speed of sound is $340 m/s$, what is the frequency of the whistle?

A. 480 Hz

B. 680 Hz

C. 840 Hz

D. 1000 Hz

Answer: B

Watch Video Solution

95. A source emitting a sound of frequency v is placed at a large distance from an observer. The source starts moving towards the observer with a uniform acceleration a. Find the frequency heard by the observer corresponding to the wave emitted just after the source starts. The speed of sound in the medium is v.

A. $\frac{vf^2}{2vf - a}$

B. $\frac{2vf^2}{2vf + a}$

C. $\frac{2vf^2}{3vf - a}$

D. $\dfrac{2vf^2}{2vf - a}$

Answer: D

Watch Video Solution

96. Due to a point isotropic sonic source, loudness at a point is $L = 60dB$ If density of air is $\rho = \left(\dfrac{15}{11}\right)\dfrac{kg}{m^3}$ and velocity of sound in air is $v = 33\dfrac{m}{s}$, the pressure oscillation amplitude at the point of observation is $\left[I_0 = 10^{-12}\dfrac{W}{m^2}\right]$

A. $0.3\frac{N}{m^2}$

B. $0.03\frac{N}{m^2}$

C. $3 \times 10^{-3}\frac{N}{m^2}$

D. $3 \times 10^{-4}\frac{N}{m^2}$

Answer: B

Watch Video Solution

97. The frequency of a car horm is 400 Hz. If the horn is honked as the car moves with a

speed $u_S = 34\frac{m}{s}$ through still air towards a stationary receiver, the wavelength of the sound passing the receiver is [velocity of sound is $340\frac{m}{s}$]

A. 0.765 m

B. 0.850 m

C. 0.935 m

D. 0.425 m

Answer: A

Watch Video Solution

98. Spherical sound waves are emitted uniformly in all direction from a point source. The variation in sound level SL. As a function of distance r from the source can be written as where a and b are positive constants.

A. $SL = -b\log r^{a}$

B. $SL = a - b(\log r)^{2}$

C. $SL = a - b\log r$

D. $SL = \dfrac{a - b}{r^{2}}$

Answer: C

Watch Video Solution

99. When a person wears a hearing aid, the sound intensity level increases by 30 dB. The sound intensity increases by

A. e^2

B. 10^3

C. 30

D. 10^2

Answer: B

Watch Video Solution

100. A motorcycle starts from rest and accelerates along a straight line at $2.2\frac{m}{s^2}$. The speed of sound is $330\frac{m}{s}$. A siren at the starting point remains stationary. When the driver hears the frequency of the siren at 90% of when motorcycle is stationary, the distance travelled by the motorcyclist is

A. `123.75 m

B. 247.5 m

C. 495 m

D. 990 m

Answer: B

Watch Video Solution

101. The difference in the speeds of sound in air at -$5^\circ C$, 60 cm pressure of mercury and

$30^{\circ}C$, 75 cm pressure of mercury is (velocity of sound in air at $0^{\circ}C$ is $332\frac{m}{s}$)

A. $15.25\frac{m}{s}$

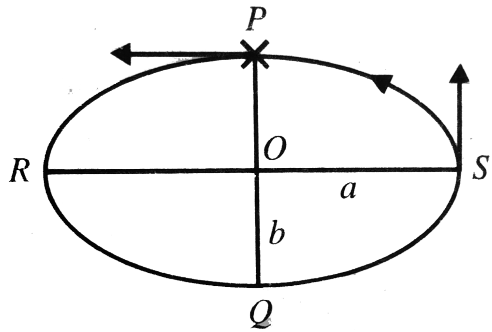
B. $21.35\frac{m}{s}$

C. $18.3\frac{m}{s}$

D. $3.05\frac{m}{s}$

Answer: B

Watch Video Solution



102.

A train is moving in an elliptical orbit in anticlockwise sense with a speed of $110\frac{m}{s}$. Guard is also moving in the given direction with same speed as that of train. The ratio of the length of major and minor axes is $\frac{4}{3}$. Driver blows a whistle of 1900 Hz at P, which is

received by guard at S. The frequency received by guard is (velocity of sound $v = 330\frac{m}{s}$)

A. 1900 Hz

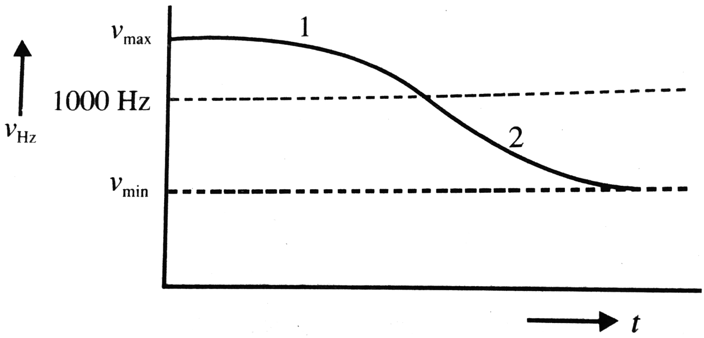
B. 1800 Hz

C. 2000 Hz

D. 1500 Hz

Answer: B

Watch Video Solution



103.

A stationary observer receives a sound from a sound of freqeuency ν_0 moving with a constant velocity $v_S = 30\frac{m}{s}$ The apparent frequency varies with time as shown in figure. Velocity of sound $v = 300\frac{m}{s}$. Then which of the following is incorrect?

A. The minimum value of apparent frequency is 889 Hz

B. The natural frequency of souce is 1000 Hz

C. The frequency time curve corresponds to a source moving at an angle to the stationary observer.

D. The maximum value of apparent frequency is 1111 Hz

Answer: A

Watch Video Solution

104. The sound from a very high burst of fireworks takes 5 s to arrive at the observer. The burst occurs 1662 m above the observer and travels vertically through two stratifier layers of air, the top one of thickness d_1 at $0^\circ C$ and the bottom one of thickness d_2 at $20^\circ C$. Then (assume velocity of sound at $0^\circ C$ is $330\frac{m}{s}$)

A. $d_1 = 342m$

B. $d_2 = 1320m$

C. $d_1 = 1485m$

D. $d_2 = 342m$

Answer: A

Watch Video Solution

105. A car emitting sound of frequency 500 Hz speeds towards a fixed wall at $4\frac{m}{s}$. An observer in the car hears both the source frequency as well as the frequency of sound reflected from

the wall. If he hears 10 beats per second between the two sounds, the velocity of sound in air will be

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

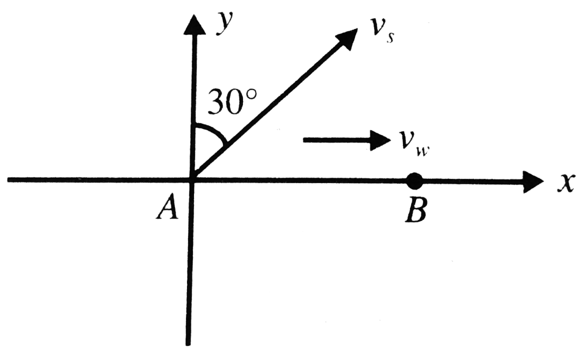
B. $387\frac{m}{s}$

C. $404\frac{m}{s}$

D. $340\frac{m}{s}$

Answer: D

Watch Video Solution



106.

In the figure shown, a source of sound of frequency 510 Hz moves with constant velocity $v_S = 20\frac{m}{s}$ in the direction shown. The wind is blowing at a constant velocity $v_W = 20\frac{m}{s}$ towards an observer who is at rest at point B. corresponding to the sound emitted by the source at initial position A, the frequency

detected by the observer is equal to (speed of sound relative to air is $330\frac{m}{s}$)

A. 510 Hz

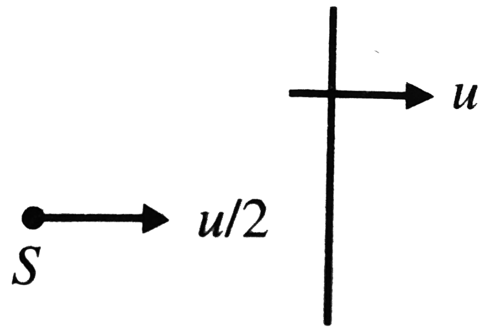
B. 500 Hz

C. 525 Hz

D. 550 Hz

Answer: C

Watch Video Solution



107.

A wall is moving with velocity u and a source of sound moves with velocity $\frac{u}{2}$ in the same direction as shown in the figure. Assuming that the sound travels with velocity $10u$, the ratio of incident sound wavelength on the wall to the reflected sound wavelength by the wall is equal to

A. $9:11$

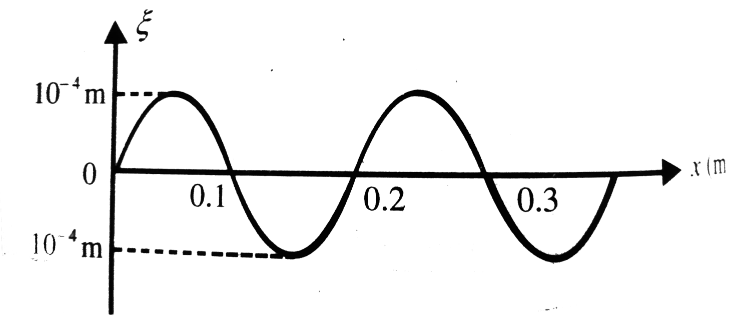
B. $11:9$

C. $4:5$

D. $5:4$

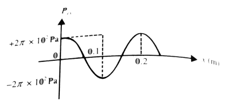
Answer: C

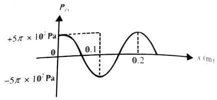
Watch Video Solution

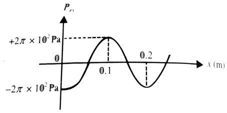


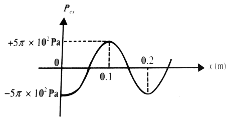
108.

For a sound wave travelling towards $+x$ direction, sinusoidal longitudinal displacement ε at a certain time is given as a function of x (Fig). If bulk modulus of air is $B = 5 \times 10^5 \frac{N}{m^2}$, the variation of pressure excess will be

A. a. 

B. b. 

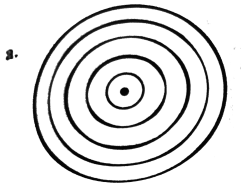
C. c. 

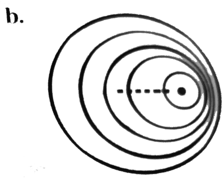
D. d. 

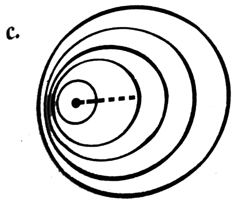
Answer: A

Watch Video Solution

109. If the source is moving towards right, wavefront of sound waves get modifies to

A. 

B. 

C. 

D. none of these

Answer: D

Watch Video Solution

110. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $f_1 \neq f_2 \neq f_3$

B. $f_1 < f_2$

C. $f_3 < f_0$

D. $f_1 < f_3 < f_2$

Answer: B

Watch Video Solution

111. When source and detector are stationary but the wind is blowing at speed v_W, the apparent wavelength λ' on the wind side is related to actual wavelength λ by [take speed of sound is air as v]

A. $\lambda' = \lambda$

B. $\lambda' = \dfrac{v_W}{v}\lambda$

C. $\lambda' = \dfrac{v_W + v}{v}\lambda$

D. $\lambda' = \dfrac{v}{v - v_W}\lambda$

Answer: C

Watch Video Solution

112.

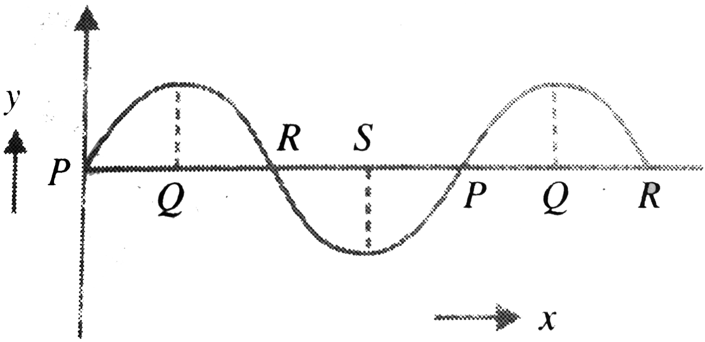


Figure. Represents the displacement y versus distance x along the direction of propagation of a longitudinal wave. The pressure is maximum at position marked

A. P

B. Q

C. R

D. S

Answer: C

Watch Video Solution

113. The driver of a car approaching a vertical wall notices that the frequency of the horn of his car changes from 400 Hz to 450 Hz after being reflected from the wall. Assuming speed of sound to be $340\frac{m}{s}$, the speed of approach of car towards the wall is

A. $10\frac{m}{s}$

B. $20\frac{m}{s}$

C. $30\frac{m}{s}$

D. $40\frac{m}{s}$

Answer: C

Watch Video Solution

114. The difference between the apparent frequency of a sound of soun as perceived by an observer during its approach and recession

is 2% of the natural frequency of the source.

If the velocity of sound in air is $300 m/s$, the velocity of the source is (It is given that velocity of source `ltlt velocity of sound)

A. $1.5\frac{m}{s}$

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

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

D. $12\frac{m}{s}$

Answer: B

Watch Video Solution

115. The frequency of a radar is 780 MHz. After getting reflected from an approaching aeroplane, the apparent frequency is more than the actual frequency by 2.6 kHz. The aeroplane has a speed of

A. $2 \frac{km}{s}$

B. $1 \frac{km}{s}$

C. $0.5 \frac{km}{s}$

D. $0.25 \frac{km}{s}$

Answer: B

Watch Video Solution

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

A. $\frac{18}{19}$

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

C. 2

D. $\frac{19}{18}$

Answer: C

Watch Video Solution

117. A siren placed at a railway platform is emitting sound of frequency $5kHz$. A passenger sitting in a moving train A records

a frequency of $5.5 kHz$ while the train approaches the siren. During his return journey in a different train B he records a frequency of $6.0 kHz$ while approaching the same siren. the ratio the velocity of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $\frac{5}{6}$

D. $\frac{11}{6}$

Answer: D

Watch Video Solution

118. A person speaking normally produces a sound intensity of $40dB$ at a distance of $1m$. If the threshold intensity for reasonable audibility is $20dB$, the maximum distance at which he can be heard cleary is.

A. 4 m

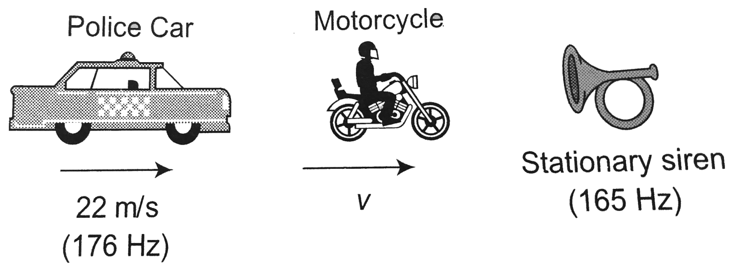
B. 5 m

C. 10 m

D. 20 m

Answer: B

Watch Video Solution

119. 

A police car moving at $22 m/s$, chases a motorcyclist, the police man sounds his horn at $176 Hz$, while both of them move towards a stationary siren of frequency $165 Hz$. Calculate the speed of the motorcycle, if it is given that

he does not observes any beat

A. $33\frac{m}{s}$

B. $22\frac{m}{s}$

C. $11\frac{m}{s}$

D. zero

Answer: C

Watch Video Solution

120. In sport meet the timing of a 200 m straight dash is recorded at the finish point by starting an accurate stop watch on hearing the sound of starting gun firen at the starting poing. The time recorded will be more accurate

A. In winter

B. in summer

C. in all seasons

D. none of these

Answer: B

Watch Video Solution

121. When a source moves away from a stationary observer, the frequency is $\frac{6}{7}$ times the original frequency. Given: speed of sound $= 330\frac{m}{s}$. The speed of the source is

A. $40\frac{m}{s}$

B. $55\frac{m}{s}$

C. $330\frac{m}{s}$

D. $165\frac{m}{s}$

Answer: B

Watch Video Solution

122. Length of a string of density ρ and Young's modulus Y under tension is increased by $\frac{1}{n}$ times of its original length If the velocity of transverse and longitudinal vibration of the string is same, find the value of such velocity.

A. $\sqrt{\dfrac{Y}{\rho n}}$

B. $\sqrt{\dfrac{Y}{\rho^{\frac{1}{2}}}}$

C. $\sqrt{\dfrac{Y}{\rho}}$

D. $\sqrt{\dfrac{Y}{\rho n^{\frac{3}{2}}}}$

Answer: B

Watch Video Solution

123. Source and observer start moving simulatneously along x and y-axis respectively. The speed of source is twice the speed of observer V_0. If the ratio of observer frequency to the frequency of the source is 0.75, find the velocity of sound.

A. $\frac{11}{\sqrt{5}} V_0$

B. $\frac{17}{\sqrt{5}} V_0$

C. $\frac{16}{\sqrt{5}} V_0$

D. $\frac{19}{\sqrt{5}} V_0$

Answer: C

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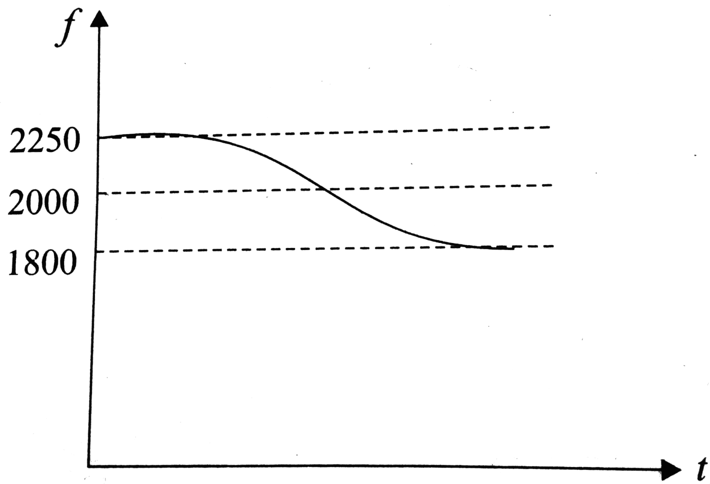


124.

A statinary observer receives a sound of frequency 2000 Hz. The variation of apparent

frequency and time is shown. Find the speed of source, if velocity of sound is $300\frac{m}{s}$

A. $66.6\frac{m}{s}$

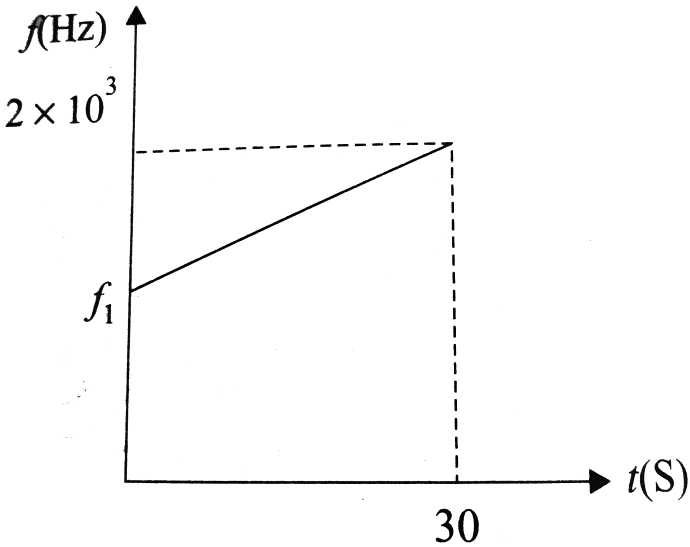
B. $33.3\frac{m}{s}$

C. $27.3\frac{m}{s}$

D. $59.3\frac{m}{s}$

Answer: B

Watch Video Solution



125.

A source of sound of frequency f_1 is placed on the ground. A detector placed at a height is released from rest on this source. The observed frequency $f(Hz)$ is plotted against time t(sec) . The speed of sound in air is $300\frac{m}{s}$.

Find f_1 $(g = 10\frac{m}{s})$.

A. $0.5 \times 10^3 Hz$

B. $2 \times 10^3 Hz$

C. $0.25 \times 10^3 Hz$

D. $0.2 \times 10^3 Hz$

Watch Video Solution

126. 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 number of wave striking the surface per second is $\frac{f((c+v))}{c}$

B. The wavelength of reflected wave is $\frac{c(c-v)}{f(c+v)}$

C. The frequency of reflected wave is $\frac{f(c+v)}{c-v}$

D. The number of beats heard by a stationary listener to the left to the

reflecting surface is $\frac{vf}{(c - v)}$

Watch Video Solution

127. A man is watching two trains, one leaving and the other coming in with equal speed of 4 m/s. If they sound their whistles, each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air is $320\frac{m}{s}$) will be equal to

A. 6

B. 3

C. 0

D. 12

Answer: A

Watch Video Solution

128. The intensity of a sound wave gets reduced by 20% on passing through a slab.

The reduction intensity on passage through two such consecutive slabs

A. 40 %

B. 36 %

C. 30 %

D. 50 %

Answer: B

Watch Video Solution

129. Two factories are sounding their sirens at 800 Hz. A man goes from one factory to the other at a speed of 2 m/s. The velocity of sound is 320 m/s. The number of beats heard by the person is 1 s will be

A. 2

B. 4

C. 8

D. 10

Answer: D

Watch Video Solution

130. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. $2.0\frac{m}{s}$

B. $2.5\frac{m}{s}$

C. $30\frac{m}{s}$

D. $3.5\frac{m}{s}$

Answer: B

Watch Video Solution

131. A train has just completed a U-curve in a trach which is a semi circle. The engine is at the forward end of the semi circular part of the trach while the last carriage is at the rear end of the semi circular track. The driver blows a whistle of frequency 200 Hz. Velocity of

sound is $340\frac{m}{s}$. Then the apparent frequency as observed by a passenger in the middle of the train, when the speed of the train is 30 m/s, is

A. 219 Hz

B. 188 Hz

C. 200 Hz

D. 181 Hz

Answer: C

Watch Video Solution

132. One train is approaching an observer at rest and another train is receding from him with the same velocity $4 m/s$. Both trains blow whistles of same frequency of $243 H_Z$. The beat frequency in H_Z as heard by observer is (speed of sound in air = $320 m/s$)

A. 10

B. 6

C. 4

D. 1

Answer: B

Watch Video Solution

133. Two sound sources are moving in opposite directions with velocities v_1 and $v_2\left(v_1 > v_2\right)$. Both are moving away from a stationary observer. The frequency of both the sources is 900 Hz. What is the value of $v_1 - v_2$ so that the beat frequency observed by the observer is 6 Hz? Speed of sound $v = 300\frac{m}{s}$. Given that v_1 and $v_2 < \; < \; < v$.

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

B. $2\frac{m}{s}$

C. $3\frac{m}{s}$

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

Answer: B

Watch Video Solution

134. The frequency changes by 10% as the source approaches a stationary observer with constant speed v_S, What sould be the

percentage change in ferquency as the source recedes from the observer with the same speed? Given that $v_S < < v$ (v speed of sound in air).

A. $14.3\,\%$

B. $20\,\%$

C. $16.7\,\%$

D. $10\,\%$

Answer: D

Watch Video Solution

135. Speed of sound wave is v. If a reflector moves towards a stationary source emitting waves of frequency f with speed u, the wavelength of reflected waves will be

A. $\frac{v - u}{v + u}f$

B. $\frac{v + u}{v}f$

C. $\frac{v + u}{v - u}f$

D. $\frac{v - u}{v}f$

Answer: C

Watch Video Solution

136. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. $1.2f$ and λ

B. f and 1.2λ

C. 0.8 and 0.8λ

D. $1.2f$ and 1.2λ

Answer: A

Watch Video Solution

137. 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 $350 m/s$

A. 750 Hz

B. 857 Hz

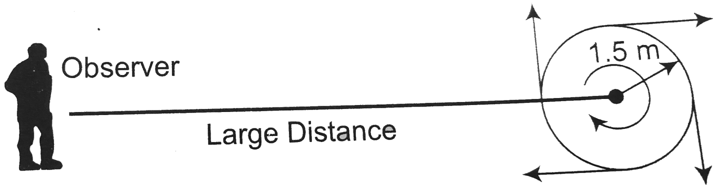
C. 1143 Hz

D. 1333 Hz

Answer: A

Watch Video Solution

138.



A whistle emitting a sound of frequency $440 Hz$ is tied to string of $1.5 m$ length and rotated with an angular velocity of $20 rad/\sec$ in the horizontal plane. Then the range of frequencies heard by an observer stationed at a large distance from the whistle will $(v = 330 m/s)$

A. 400.0 Hz to 484.0 Hz

B. 403.3 Hz to 480.0 Hz

C. 400.0 Hz to 480.0 Hz

D. 403.3 Hz to 484.0 Hz

Answer: D

Watch Video Solution

139. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an

expression for the beat frequency heard by the motorist.

A. $\frac{v+v_m}{v+v_b}f$

B. $\frac{v+v_m}{v-v_b}f$

C. $\frac{2v_b\left(v+v_m\right)}{v^2-v_b^2}f$

D. $\frac{2v_m\left(v+v_b\right)}{v^2-v_m^2}f$

Answer: C

Watch Video Solution

140. A man standing on a platform hears the sound of frequency 604 Hz coming from a frequency 550 Hz from a train whistle moving towards the platform. If the velocity of sound is 330 m/s, then what is the speed of train?

A. $30\frac{m}{s}$

B. $35\frac{m}{s}$

C. $40\frac{m}{s}$

D. $45\frac{m}{s}$

Answer: A

Watch Video Solution

141. A vehicle , with a horn of frequency n is moving with a velocity of $30m/s$ in a direction prependicular to the straight line joining the observer and the vehicle . The observer perceives the sound to have a grequency $(n+n_1)$. If the sound velocity in air is $330m/s$, then

A. $n_1 = 10n$

B. $n_1 = -n$

C. $n_1 = 0.1n$

D. $n_1 = 0$

Answer: D

Watch Video Solution

142. An isotropic stationary source is emitting waves of frequency n and wind is blowing due north. An observer A is on north of the source while observer B is on south the source. IF both the observers are stationary, then

A. frequency received by A is greater than n

B. frequency received by B is less than n

C. freqeuency received by A equals to that received by B

D. frequencies received by A and B cannot be calculated unless velocity of waves in still air and velcity of wind are known

Answer: C

Watch Video Solution

143. A train is moving with a constant speed along a circular track. The engine of the train emits a sound of frequency f. The frequency heard by the guard at the rear end of the train.

A. is less than f

B. is greater than f

C. is equal to f

D. may be greater than less than or equal to f depending on factors like speed of

train, length of train and radius of circular track.

Answer: C

Watch Video Solution

144. 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. $5\ \%$

B. $20\ \%$

C. $0\ \%$

D. $0.5\ \%$

Answer: B

Watch Video Solution

145. An increase in intensity level of 1 dB implies an increase in intensity of (given anti $\log_{10} 0.1 = 1.2589$)

A. 1%

B. 3.01%

C. 26%

D. 0.1%

Answer: C

Watch Video Solution

146. In expressing sound intensity we take $10^{-12}\frac{W}{m^2}$ as the reference level. For ordinary

conversation the intensity level is about $10^{-6}\frac{W}{m^2}$. Expressed in decibel, this is

A. 10^6

B. 6

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

147. The intensity level of two sounds are 100 dB and 50 dB. What is the ratio of their intensities?

A. 10^1

B. 10^3

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

148. An engine running at speed $\frac{v}{10}$ sounds a whistle of frequency 600 Hz. A passenger in a train coming from the oppsite side at speed of $\frac{v}{15}$ experiences this whistle to be of frequency f. If v is speed of sound in air and there is no wind. F is nearest to

A. 711 Hz

B. 630 Hz

C. 580 Hz

D. 510 Hz

Answer: A

Watch Video Solution

149. A source of sound produces waves of wavelength 60 cm when it is stationary if the speed of sound in air is $320\frac{m}{s}$ and source moves with speed $20\frac{m}{s}$, the wavelength of sound in the forward direction will be nearest to

A. 56 cm

B. 60 cm

C. 64 cm

D. 68 cm

Answer: A

Watch Video Solution

150. The apparent frequency of the whistle of an engine changes in the ratio 6:5 as the engine passes a stationary observer. If the

velocity of sound is $330\frac{m}{s}$, then the velocity of the engine is

A. $3\frac{m}{s}$

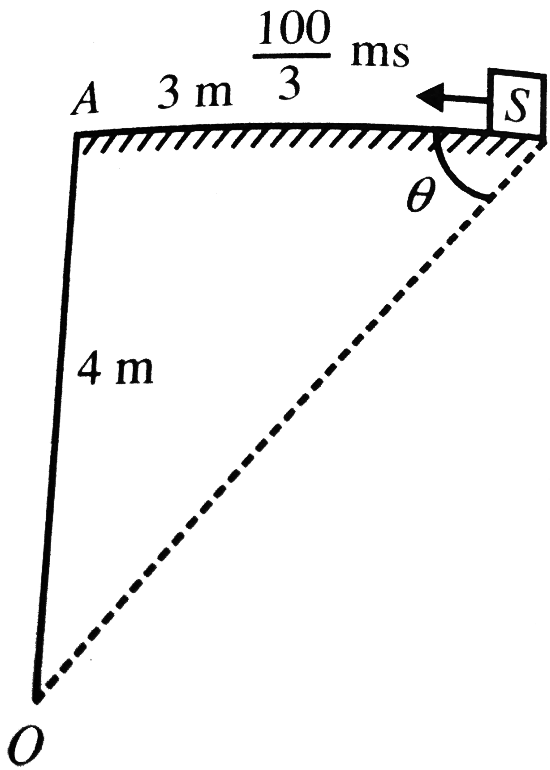
B. $30\frac{m}{s}$

C. $0.33\frac{m}{s}$

D. $660\frac{m}{s}$

Answer: B

Watch Video Solution



151.

A source of sound S is travelling at $\frac{100}{3}\frac{m}{s}$ along a road, towards a point A. When the source is 3 m away from A, a person standint at a point O on a road perpendicular to AS

hears a sound of requency v'. The distance of O from A at that time is 4 m. If the original frequency is 640 Hz, then the value of v' is (velocity of sound is $340\frac{m}{s}$)

A. 620 Hz

B. 680 Hz

C. 720 Hz

D. 840 Hz

Answer: B

Watch Video Solution

152. A source of sound is travelling with a velocity of $30\frac{m}{s}$ towards a stationary observer. If actual frequency of source is 1000 Hz and the wind is blowing with velocity $20\frac{m}{s}$ in a direction at $60^{\circ}C$ with the direction of motion of source, then the apparent frequency heard by observer is (speed of sound is $340\frac{m}{s}$)

A. 1011 Hz

B. 1000 Hz

C. 1094 Hz

D. 1086 Hz

Answer: C

Watch Video Solution

153. A source of sound emits $200\pi W$ power which is uniformly distributed over a sphere of radius 10 m. What is the loudness of sound on the surface of the sphere?

A. 70 dB

B. 107 dB

C. 80 dB

D. 117 dB

Answer: D

Watch Video Solution

154. Two cars are moving on two perpendicular roads towards a crossing with uniform speeds

of $72\frac{km}{h}$ and $36\frac{km}{h}$. If second car blows horn of frequency 280 Hz, then the frequency of horn heard by the driver of first car when the line joining the cars makes angle of $45\,^{\circ}C$ with the roads, will be (velocity of sound is $330\frac{m}{s}$)

A. 321 Hz

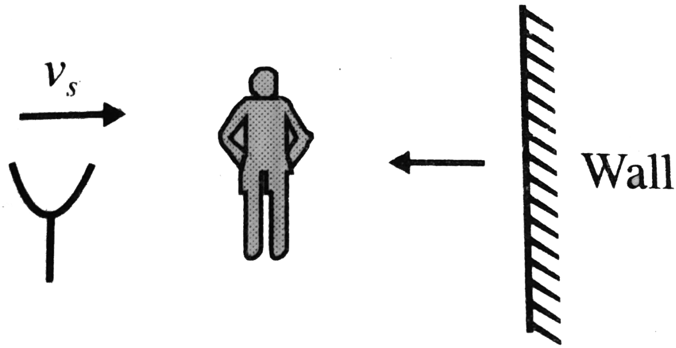
B. 298 Hz

C. 289 Hz

D. 280 Hz

Answer: B

Watch Video Solution



155.

A tuning fork of frequency 380 Hz is moving towards a wall with a velocity of $4\frac{m}{s}$ Then the number of beats heard by a stationary listener between direct and reflected sound will be (velocity of sound in air is $340\frac{m}{s}$)

A. 0

B. 5

C. 7

D. 10

Answer: A

Watch Video Solution

156.

A sound wave of frequency n travels horizontally to the right with speed with speed c. It is reflected from a broad wall moving to the left with speed v. The number of beats heard by a stationary observer to the left of the wall is

A. zero

B. $\dfrac{n(c+v)}{c-v}$

C. $\dfrac{nv}{c-v}$

D. $\dfrac{2nv}{c-v}$

Answer: D

Watch Video Solution

157. A boy is walking away from a well at a speed of $1.0m/s$ in a direction at right angles to the wall. As he walks, he below a whistle steadily. An observer towards whom the boy is walking hears 4.0 beats per second. If the speed of sound is $340 m / s$, what is the frequency of the whistle?

A. 480 Hz

B. 680 Hz

C. 840 Hz

D. 1000 Hz

Answer: B

Watch Video Solution

158. A source emitting a sound of frequency v is placed at a large distance from an observer. The source starts moving towards the observer with a uniform acceleration a. Find the frequency heard by the observer corresponding to the wave emitted just after the source starts. The speed of sound in the medium is v.

A. $\frac{vf^2}{2vf - a}$

B. $\frac{2vf^2}{2vf + a}$

C. $\frac{2vf^2}{3vf - a}$

D. $\dfrac{2vf^2}{2vf - a}$

Answer: D

Watch Video Solution

159. Due to a point isotropic sonic source, loudness at a point is $L = 60dB$ If density of air is $\rho = \left(\dfrac{15}{11}\right)\dfrac{kg}{m^3}$ and velocity of sound in air is $v = 33\dfrac{m}{s}$, the pressure oscillation amplitude at the point of observation is $\left[I_0 = 10^{-12}\dfrac{W}{m^2}\right]$

A. $0.3\frac{N}{m^2}$

B. $0.03\frac{N}{m^2}$

C. $3 \times 10^{-3}\frac{N}{m^2}$

D. $3 \times 10^{-4}\frac{N}{m^2}$

Answer: B

Watch Video Solution

160. The frequency of a car horm is 400 Hz. If the horn is honked as the car moves with a

speed $u_S = 34\frac{m}{s}$ through still air towards a stationary receiver, the wavelength of the sound passing the receiver is [velocity of sound is $340\frac{m}{s}$]

A. 0.765 m

B. 0.850 m

C. 0.935 m

D. 0.425 m

Answer: A

Watch Video Solution

161. Spherical sound waves are emitted uniformly in all direction from a point source. The variation in sound level SL. As a function of distance r from the source can be written as where a and b are positive constants.

A. $SL = - b\log r^{a}$

B. $SL = a - b(\log r)^{2}$

C. $SL = a - b\log r$

D. $SL = \frac{a - b}{r^{2}}$

Answer: C

Watch Video Solution

162. When a person wears a hearing aid, the sound intensity level increases by 30 dB. The sound intensity increases by

A. e^2

B. 10^3

C. 30

D. 10^2

Answer: B

Watch Video Solution

163. A motorcycle starts from rest and accelerates along a straight line at $2.2\frac{m}{s^2}$. The speed of sound is $330\frac{m}{s}$. A siren at the starting point remains stationary. When the driver hears the frequency of the siren at 90% of when motorcycle is stationary, the distance travelled by the motorcyclist is

A. `123.75 m

B. 247.5 m

C. 495 m

D. 990 m

Answer: B

Watch Video Solution

164. The difference in the speeds of sound in air at -$5^{\circ}C$, 60 cm pressure of mercury and

$30^{\circ}C$, 75 cm pressure of mercury is (velocity of sound in air at $0^{\circ}C$ is $332\frac{m}{s}$)

A. $15.25\frac{m}{s}$

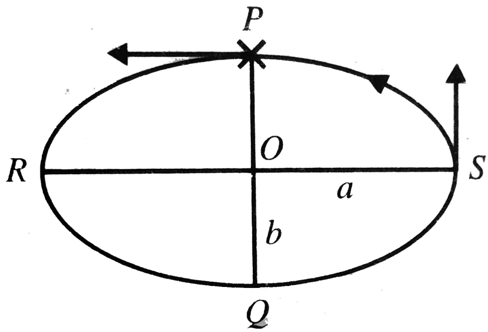
B. $21.35\frac{m}{s}$

C. $18.3\frac{m}{s}$

D. $3.05\frac{m}{s}$

Answer: B

Watch Video Solution



165.

A train is moving in an elliptical orbit in anticlockwise sense with a speed of $110\frac{m}{s}$. Guard is also moving in the given direction with same speed as that of train. The ratio of the length of major and minor axes is $\frac{4}{3}$. Driver blows a whistle of 1900 Hz at P, which is

received by guard at S. The frequency received by guard is (velocity of sound $v = 330\frac{m}{s}$)

A. 1900 Hz

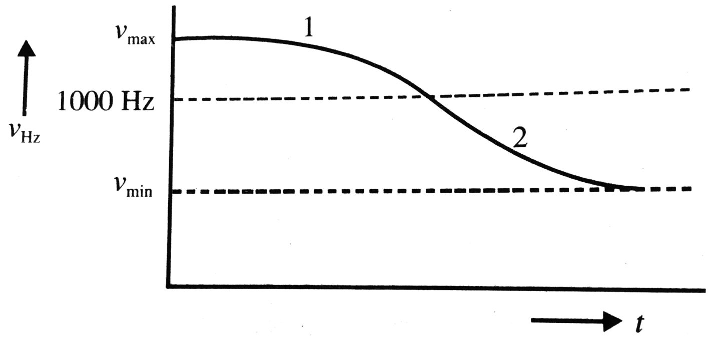
B. 1800 Hz

C. 2000 Hz

D. 1500 Hz

Answer: B

Watch Video Solution



166.

A stationary observer receives a sound from a sound of freqeuency ν_0 moving with a constant velocity $v_S = 30\frac{m}{s}$ The apparent frequency varies with time as shown in figure. Velocity of sound $v = 300\frac{m}{s}$. Then which of the following is incorrect?

A. The minimum value of apparent frequency is 889 Hz

B. The natural frequency of souce is 1000 Hz

C. The frequency time curve corresponds to a source moving at an angle to the stationary observer.

D. The maximum value of apparent frequency is 1111 Hz

Answer: A

Watch Video Solution

167. The sound from a very high burst of fireworks takes 5 s to arrive at the observer. The burst occurs 1662 m above the observer and travels vertically through two stratifier layers of air, the top one of thickness d_1 at $0\,^{\circ}C$ and the bottom one of thickness d_2 at $20\,^{\circ}C$. Then (assume velocity of sound at $0\,^{\circ}C$ is $330\frac{m}{s}$)

A. $d_1 = 342m$

B. $d_2 = 1320m$

C. $d_1 = 1485m$

D. $d_2 = 342m$

Answer: A

Watch Video Solution

168. A car emitting sound of frequency 500 Hz speeds towards a fixed wall at $4\frac{m}{s}$. An observer in the car hears both the source frequency as well as the frequency of sound reflected from

the wall. If he hears 10 beats per second between the two sounds, the velocity of sound in air will be

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

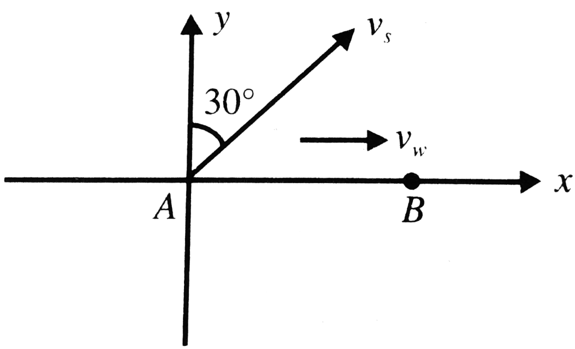
B. $387\frac{m}{s}$

C. $404\frac{m}{s}$

D. $340\frac{m}{s}$

Answer: D

Watch Video Solution



169.

In the figure shown, a source of sound of frequency 510 Hz moves with constant velocity $v_S = 20\frac{m}{s}$ in the direction shown. The wind is blowing at a constant velocity $v_W = 20\frac{m}{s}$ towards an observer who is at rest at point B. corresponding to the sound emitted by the source at initial position A, the frequency

detected by the observer is equal to (speed of sound relative to air is $330\frac{m}{s}$)

A. 510 Hz

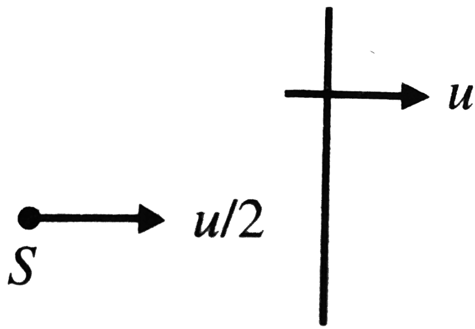
B. 500 Hz

C. 525 Hz

D. 550 Hz

Answer: C

Watch Video Solution



170.

A wall is moving with velocity u and a source of sound moves with velocity $\frac{u}{2}$ in the same direction as shown in the figure. Assuming that the sound travels with velocity $10u$, the ratio of incident sound wavelength on the wall to the reflected sound wavelength by the wall is equal to

A. $9:11$

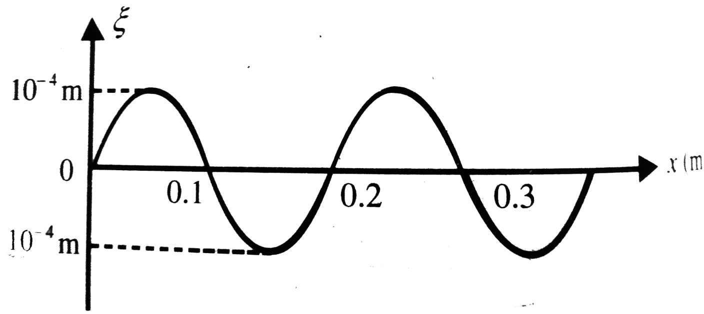
B. $11:9$

C. $4:5$

D. $5:4$

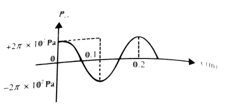
Answer: C

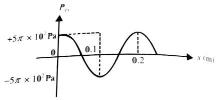
Watch Video Solution

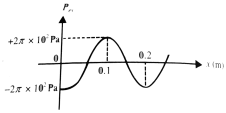


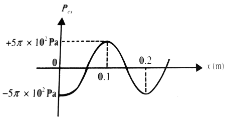
171.

For a sound wave travelling towards $+x$ direction, sinusoidal longitudinal displacement ε at a certain time is given as a function of x (Fig). If bulk modulus of air is $B = 5 \times 10^5 \frac{N}{m^2}$, the variation of pressure excess will be

A. a. 

B. b. 

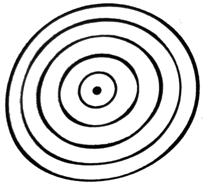
C. c. 

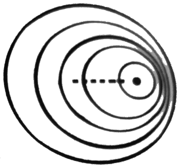
D. d. 

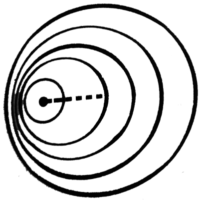
Answer: A

Watch Video Solution

172. If the source is moving towards right, wavefront of sound waves get modifies to

A. 

B. 

C. 

D. none of these

Answer: D

Watch Video Solution

173. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $f_1 \neq f_2 \neq f_3$

B. $f_1 < f_2$

C. $f_3 < f_0$

D. $f_1 < f_3 < f_2$

Answer: B

Watch Video Solution

174. When source and detector are stationary but the wind is blowing at speed v_W, the apparent wavelength λ' on the wind side is related to actual wavelength λ by [take speed of sound is air as v]

A. $\lambda' = \lambda$

B. $\lambda' = \dfrac{v_W}{v}\lambda$

C. $\lambda' = \dfrac{v_W + v}{v}\lambda$

D. $\lambda' = \dfrac{v}{v - v_W}\lambda$

Answer: C

Watch Video Solution

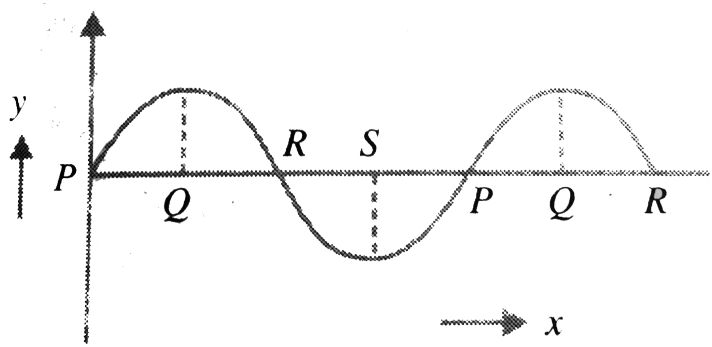
175. 

Figure. Represents the displacement y versus distance x along the direction of propagation of a longitudinal wave. The pressure is maximum at position marked

A. P

B. Q

C. R

D. S

Answer: C

Watch Video Solution

176. The driver of a car approaching a vertical wall notices that the frequency of the horn of his car changes from 400 Hz to 450 Hz after being reflected from the wall. Assuming speed of sound to be $340\frac{m}{s}$, the speed of approach of car towards the wall is

A. $10\frac{m}{s}$

B. $20\frac{m}{s}$

C. $30\frac{m}{s}$

D. $40\frac{m}{s}$

Answer: C

Watch Video Solution

177. The difference between the apparent frequency of a sound of soun as perceived by an observer during its approach and recession

is 2% of the natural frequency of the source.

If the velocity of sound in air is $300 m/s$, the velocity of the source is (It is given that velocity of source `ltlt velocity of sound)

A. $1.5\frac{m}{s}$

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

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

D. $12\frac{m}{s}$

Answer: B

Watch Video Solution

178. The frequency of a radar is 780 MHz. After getting reflected from an approaching aeroplane, the apparent frequency is more than the actual frequency by 2.6 kHz. The aeroplane has a speed of

A. $2\frac{km}{s}$

B. $1\frac{km}{s}$

C. $0.5\frac{km}{s}$

D. $0.25\frac{km}{s}$

Answer: B

Watch Video Solution

179. 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 train's speed is reduced to $17 m/s$, the frequency registered is f_2. If the speed of sound of $340 m/s$, then the ratio f_1/f_2 is

A. $\frac{18}{19}$

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

C. 2

D. $\frac{19}{18}$

Answer: C

Watch Video Solution

180. A siren placed at a railway platform is emitting sound of frequency $5kHz$. A passenger sitting in a moving train A records

a frequency of $5.5kHz$ while the train approaches the siren. During his return journey in a different train B he records a frequency of $6.0kHz$ while approaching the same siren. the ratio the velocity of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $\frac{5}{6}$

D. $\frac{11}{6}$

Answer: D

Watch Video Solution

181. A person speaking normally produces a sound intensity of $40dB$ at a distance of $1m$. If the threshold intensity for reasonable audibility is $20dB$, the maximum distance at which he can be heard cleary is.

A. 4 m

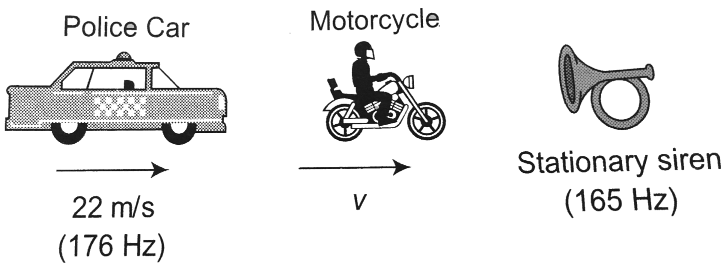
B. 5 m

C. 10 m

D. 20 m

Answer: B

Watch Video Solution

182. 

A police car moving at $22m/s$, chases a motorcyclist, the police man sounds his horn at $176Hz$, while both of them move towards a stationary siren of frequency $165Hz$. Calculate

the speed of the motorcycle, if it is given that he does not observes any beat

A. $33\frac{m}{s}$

B. $22\frac{m}{s}$

C. $11\frac{m}{s}$

D. zero

Answer: C

Watch Video Solution

183. In sport meet the timing of a 200 m straight dash is recorded at the finish point by starting an accurate stop watch on hearing the sound of starting gun firen at the starting poing. The time recorded will be more accurate

A. In winter

B. in summer

C. in all seasons

D. none of these

Answer: B

Watch Video Solution

184. When a source moves away from a stationary observer, the frequency is $\frac{6}{7}$ times the original frequency. Given: speed of sound $= 330\frac{m}{s}$. The speed of the source is

A. $40\frac{m}{s}$

B. $55\frac{m}{s}$

C. $330\frac{m}{s}$

D. $165\frac{m}{s}$

Answer: B

Watch Video Solution

185. Length of a string of density ρ and Young's modulus Y under tension is increased by $\frac{1}{n}$ times of its original length If the velocity of transverse and longitudinal vibration of the string is same, find the value of such velocity.

A. $\sqrt{\frac{Y}{\rho n}}$

B. $\sqrt{\frac{Y}{\rho^{\frac{1}{2}}}}$

C. $\sqrt{\frac{Y}{\rho}}$

D. $\sqrt{\frac{Y}{\rho n^{\frac{3}{2}}}}$

Answer: B

Watch Video Solution

186. Source and observer start moving simulatneously along x and y-axis respectively. The speed of source is twice the speed of observer V_0. If the ratio of observer frequency to the frequency of the source is 0.75, find the velocity of sound.

A. $\frac{11}{\sqrt{5}} V_0$

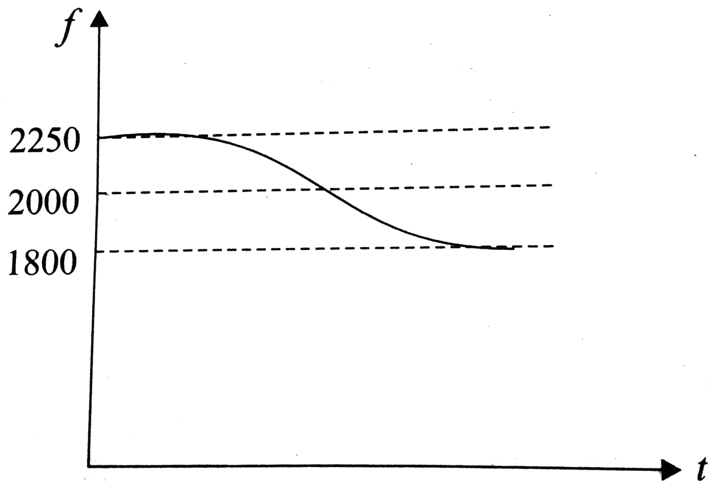
B. $\frac{17}{\sqrt{5}} V_0$

C. $\frac{16}{\sqrt{5}} V_0$

D. $\frac{19}{\sqrt{5}} V_0$

Answer: C

Watch Video Solution



187.

A statinary observer receives a sound of frequency 2000 Hz. The variation of apparent

frequency and time is shown. Find the speed of source, if velocity of sound is $300\frac{m}{s}$

A. $66.6\frac{m}{s}$

B. $33.3\frac{m}{s}$

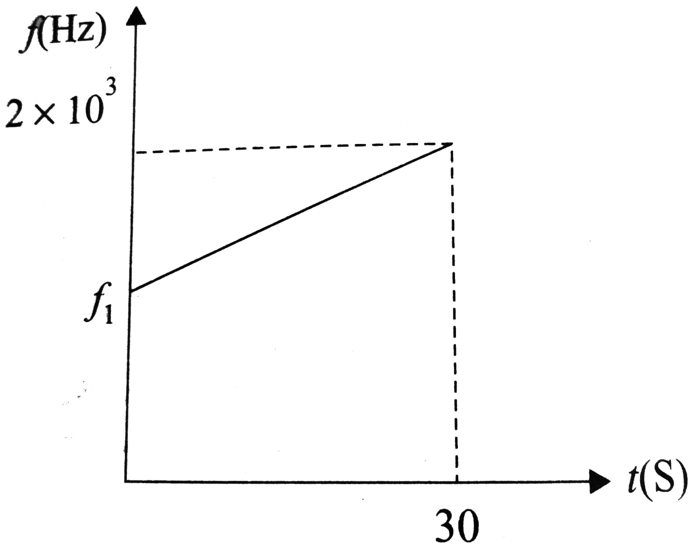
C. $27.3\frac{m}{s}$

D. $59.3\frac{m}{s}$

Answer: B

Watch Video Solution

188.



A source of sound of frequency f_1 is placed on the ground. A detector placed at a height is released from rest on this source. The observed frequency $f(Hz)$ is plotted against time t(sec). The speed of sound in air is $300\frac{m}{s}$.

Find f_1 $(g = 10\frac{m}{s})$.

A. $0.5 \times 10^3 Hz$

B. $2 \times 10^3 Hz$

C. $0.25 \times 10^3 Hz$

D. $0.2 \times 10^3 Hz$

Watch Video Solution

189. 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 number of wave striking the surface per second is $\frac{f((c+v))}{c}$

B. The wavelength of reflected wave is $\frac{c(c-v)}{f(c+v)}$

C. The frequency of reflected wave is $\frac{f(c+v)}{c-v}$

D. The number of beats heard by a stationary listener to the left to the

reflecting surface is $\frac{vf}{(c - v)}$

Watch Video Solution

190. A man is watching two trains, one leaving and the other coming in with equal speed of 4 m/s. If they sound their whistles, each of frequency 240 Hz, the number of beats heard by the man (velocity of sound in air is $320\frac{m}{s}$) will be equal to

A. 6

B. 3

C. 0

D. 12

Answer: A

Watch Video Solution

191. The intensity of a sound wave gets reduced by 20% on passing through a slab.

The reduction intensity on passage through two such consecutive slabs

A. 40 %

B. 36 %

C. 30 %

D. 50 %

Answer: B

Watch Video Solution

192. Two factories are sounding their sirens at 800 Hz. A man goes from one factory to the other at a speed of 2 m/s. The velocity of sound is 320 m/s. The number of beats heard by the person is 1 s will be

A. 2

B. 4

C. 8

D. 10

Answer: D

Watch Video Solution

193. Two sources A and B are sounding notes of frequency 680 Hz. A listener moves from A to B with a constant velocity u. If the speed of sound is 340 m/s, What must be the value of u so that he hears 10 beats per second?

A. $2.0\frac{m}{s}$

B. $2.5\frac{m}{s}$

C. $30\frac{m}{s}$

D. $3.5\frac{m}{s}$

Answer: B

Watch Video Solution

194. A train has just completed a U-curve in a trach which is a semi circle. The engine is at the forward end of the semi circular part of the trach while the last carriage is at the rear end of the semi circular track. The driver blows a whistle of frequency 200 Hz. Velocity of

sound is $340\frac{m}{s}$. Then the apparent frequency as observed by a passenger in the middle of the train, when the speed of the train is 30 m/s, is

A. 219 Hz

B. 188 Hz

C. 200 Hz

D. 181 Hz

Answer: C

Watch Video Solution

195. One train is approaching an observer at rest and another train is receding from him with the same velocity $4m/s$. Both trains blow whistles of same frequency of $243H_Z$. The beat frequency in H_Z as heard by observer is (speed of sound in air = $320m/s$)

A. 10

B. 6

C. 4

D. 1

Answer: B

Watch Video Solution

196. Two sound sources are moving in opposite directions with velocities v_1 and $v_2(v_1 > v_2)$. Both are moving away from a stationary observer. The frequency of both the sources is 900 Hz. What is the value of $v_1 - v_2$ so that the beat frequency observed by the observer is 6 Hz? Speed of sound $v = 300\frac{m}{s}$. Given that v_1 and $v_2 < < < v$.

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

B. $2\frac{m}{s}$

C. $3\frac{m}{s}$

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

Answer: B

Watch Video Solution

197. The frequency changes by 10% as the source approaches a stationary observer with constant speed v_S, What sould be the

percentage change in ferquency as the source recedes from the observer with the same speed? Given that $v_S < < v$ (v speed of sound in air).

A. 14.3%

B. 20%

C. 16.7%

D. 10%

Answer: D

Watch Video Solution

198. Speed of sound wave is v. If a reflector moves towards a stationary source emitting waves of frequency f with speed u, the wavelength of reflected waves will be

A. $\frac{v - u}{v + u}f$

B. $\frac{v + u}{v}f$

C. $\frac{v + u}{v - u}f$

D. $\frac{v - u}{v}f$

Answer: C

Watch Video Solution

199. An observer moves towards a stationary source of sound with a speed $\left(\frac{1}{5}\right)$th of the speed of sound. The wavelength and frequency of the source emitted are λ and f, respectively. The apparent frequency and wavelength recorded by the observer are, respectively.

A. $1.2f$ and λ

B. f and 1.2λ

C. 0.8 and 0.8λ

D. $1.2f$ and 1.2λ

Answer: A

Watch Video Solution

200. 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 $350 m/s$

A. 750 Hz

B. 857 Hz

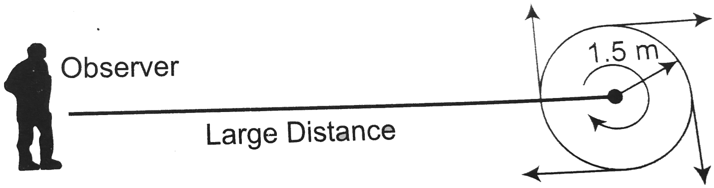
C. 1143 Hz

D. 1333 Hz

Answer: A

Watch Video Solution

201.



A whistle emitting a sound of frequency $440Hz$ is tied to string of $1.5m$ length and rotated with an angular velocity of $20rad/\sec$ in the horizontal plane. Then the range of frequencies heard by an observer stationed at a large distance from the whistle will $(v = 330m/s)$

A. 400.0 Hz to 484.0 Hz

B. 403.3 Hz to 480.0 Hz

C. 400.0 Hz to 480.0 Hz

D. 403.3 Hz to 484.0 Hz

Answer: D

Watch Video Solution

202. A band playing music at a frequency f is moving towards a wall at a speed v_b. A motorist is following the band with a speed v_m. If v is the speed of sound, obtain an

expression for the beat frequency heard by the motorist.

A. $\frac{v+v_m}{v+v_b}f$

B. $\frac{v+v_m}{v-v_b}f$

C. $\frac{2v_b\left(v+v_m\right)}{v^2-v_b^2}f$

D. $\frac{2v_m\left(v+v_b\right)}{v^2-v_m^2}f$

Answer: C

Watch Video Solution

203. A man standing on a platform hears the sound of frequency 604 Hz coming from a frequency 550 Hz from a train whistle moving towards the platform. If the velocity of sound is 330 m/s, then what is the speed of train?

A. $30\frac{m}{s}$

B. $35\frac{m}{s}$

C. $40\frac{m}{s}$

D. $45\frac{m}{s}$

Answer: A

Watch Video Solution

204. A vehicle , with a horn of frequency n is moving with a velocity of $30m/s$ in a direction prependicular to the straight line joining the observer and the vehicle . The observer perceives the sound to have a grequency $(n+n_1)$. If the sound velocity in air is $330m/s$, then

A. $n_1 = 10n$

B. $n_1 = -n$

C. $n_1 = 0.1n$

D. $n_1 = 0$

Answer: D

Watch Video Solution

205. An isotropic stationary source is emitting waves of frequency n and wind is blowing due north. An observer A is on north of the source while observer B is on south the source. IF both the observers are stationary, then

A. frequency received by A is greater than n

B. frequency received by B is less than n

C. freqeuency received by A equals to that received by B

D. frequencies received by A and B cannot be calculated unless velocity of waves in still air and velcity of wind are known

Answer: C

Watch Video Solution

206. A train is moving with a constant speed along a circular track. The engine of the train emits a sound of frequency f. The frequency heard by the guard at the rear end of the train.

A. is less than f

B. is greater than f

C. is equal to f

D. may be greater than less than or equal to f depending on factors like speed of

train, length of train and radius of circular track.

Answer: C

Watch Video Solution

207. 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. 5 %

B. 20 %

C. 0 %

D. 0.5 %

Answer: B

Watch Video Solution

208. An increase in intensity level of 1 dB implies an increase in intensity of (given anti $\log_{10} 0.1 = 1.2589$)

A. 1 %

B. 3.01 %

C. 26 %

D. 0.1 %

Answer: C

Watch Video Solution

209. In expressing sound intensity we take $10^{-12}\frac{W}{m^2}$ as the reference level. For ordinary

conversation the intensity level is about $10^{-6}\frac{W}{m^2}$. Expressed in decibel, this is

A. 10^6

B. 6

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

210. The intensity level of two sounds are 100 dB and 50 dB. What is the ratio of their intensities?

A. 10^1

B. 10^3

C. 10^5

D. 10^{10}

Answer: C

Watch Video Solution

211. An engine running at speed $\frac{v}{10}$ sounds a whistle of frequency 600 Hz. A passenger in a train coming from the oppsite side at speed of $\frac{v}{15}$ experiences this whistle to be of frequency f. If v is speed of sound in air and there is no wind. F is nearest to

A. 711 Hz

B. 630 Hz

C. 580 Hz

D. 510 Hz

Answer: A

Watch Video Solution

212. A source of sound produces waves of wavelength 60 cm when it is stationary if the speed of sound in air is $320\frac{m}{s}$ and source moves with speed $20\frac{m}{s}$, the wavelength of sound in the forward direction will be nearest to

A. 56 cm

B. 60 cm

C. 64 cm

D. 68 cm

Answer: A

Watch Video Solution

213. The apparent frequency of the whistle of an engine changes in the ratio 6:5 as the engine passes a stationary observer. If the

velocity of sound is $330\frac{m}{s}$, then the velocity of the engine is

A. $3\frac{m}{s}$

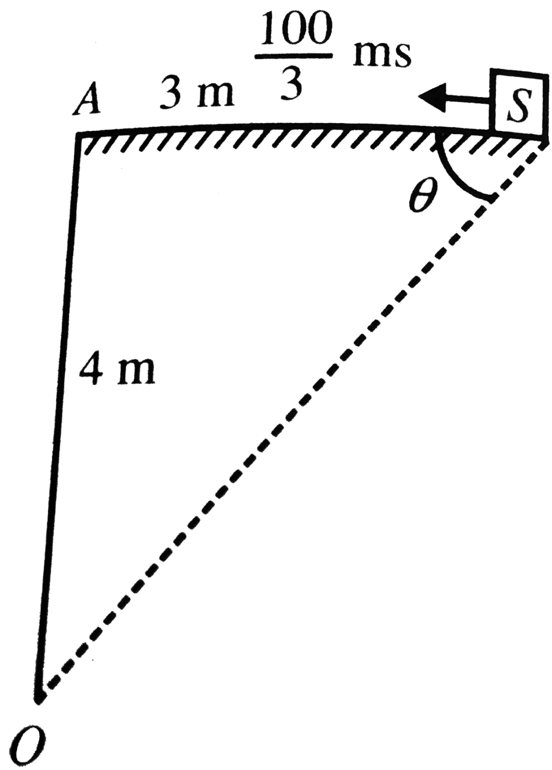
B. $30\frac{m}{s}$

C. $0.33\frac{m}{s}$

D. $660\frac{m}{s}$

Answer: B

Watch Video Solution



214.

A source of sound S is travelling at $\frac{100}{3}\frac{m}{s}$ along a road, towards a point A. When the source is 3 m away from A, a person standint at a point O on a road perpendicular to AS

hears a sound of requency v'. The distance of O from A at that time is 4 m. If the original frequency is 640 Hz, then the value of v' is (velocity of sound is $340\frac{m}{s}$)

A. 620 Hz

B. 680 Hz

C. 720 Hz

D. 840 Hz

Answer: B

Watch Video Solution

215. A source of sound is travelling with a velocity of $30\frac{m}{s}$ towards a stationary observer. If actual frequency of source is 1000 Hz and the wind is blowing with velocity $20\frac{m}{s}$ in a direction at $60^{\circ}C$ with the direction of motion of source, then the apparent frequency heard by observer is (speed of sound is $340\frac{m}{s}$)

A. 1011 Hz

B. 1000 Hz

C. 1094 Hz

D. 1086 Hz

Answer: C

Watch Video Solution

216. A source of sound emits $200\pi W$ power which is uniformly distributed over a sphere of radius 10 m. What is the loudness of sound on the surface of the sphere?

A. 70 dB

B. 107 dB

C. 80 dB

D. 117 dB

Answer: D

Watch Video Solution

217. Two cars are moving on two perpendicular roads towards a crossing with uniform speeds

of $72\frac{km}{h}$ and $36\frac{km}{h}$. If second car blows horn of frequency 280 Hz, then the frequency of horn heard by the driver of first car when the line joining the cars makes angle of $45^{\circ}C$ with the roads, will be (velocity of sound is $330\frac{m}{s}$)

A. 321 Hz

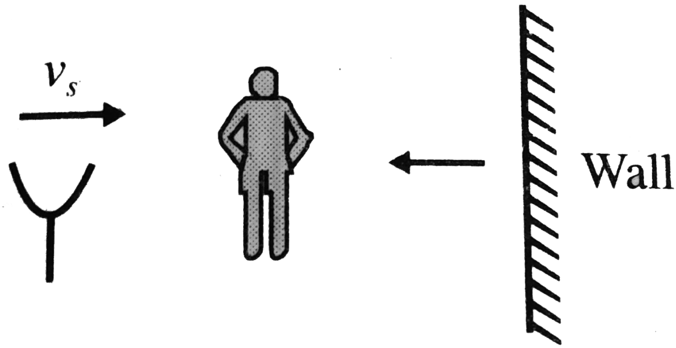
B. 298 Hz

C. 289 Hz

D. 280 Hz

Answer: B

Watch Video Solution



218.

A tuning fork of frequency 380 Hz is moving towards a wall with a velocity of $4\frac{m}{s}$ Then the number of beats heard by a stationary listener between direct and reflected sound will be (velocity of sound in air is $340\frac{m}{s}$)

A. 0

B. 5

C. 7

D. 10

Answer: A

Watch Video Solution

219.

A sound wave of frequency n travels horizontally to the right with speed with speed c. It is reflected from a broad wall moving to the left with speed v. The number of beats heard by a stationary observer to the left of the wall is

A. zero

B. $\frac{n(c+v)}{c-v}$

C. $\frac{nv}{c-v}$

D. $\frac{2nv}{c-v}$

Answer: D

Watch Video Solution

220. A boy is walking away from a well at a speed of $1.0m/s$ in a direction at right angles to the wall. As he walks, he below a whistle steadily. An observer towards whom the boy is walking hears 4.0 beats per second. If the speed of sound is $340 m/s$, what is the frequency of the whistle?

A. 480 Hz

B. 680 Hz

C. 840 Hz

D. 1000 Hz

Answer: B

Watch Video Solution

221. A source emitting a sound of frequency v is placed at a large distance from an observer. The source starts moving towards the observer with a uniform acceleration a. Find the frequency heard by the observer corresponding to the wave emitted just after the source starts. The speed of sound in the medium is v.

A. $\dfrac{vf^2}{2vf - a}$

B. $\dfrac{2vf^2}{2vf + a}$

C. $\dfrac{2vf^2}{3vf - a}$

D. $\frac{2vf^2}{2vf - a}$

Answer: D

Watch Video Solution

222. Due to a point isotropic sonic source, loudness at a point is $L = 60dB$ If density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $v = 33\frac{m}{s}$, the pressure oscillation amplitude at the point of observation is $\left[I_0 = 10^{-12}\frac{W}{m^2}\right]$

A. $0.3\frac{N}{m^2}$

B. $0.03\frac{N}{m^2}$

C. $3 \times 10^{-3}\frac{N}{m^2}$

D. $3 \times 10^{-4}\frac{N}{m^2}$

Answer: B

Watch Video Solution

223. The frequency of a car horm is 400 Hz. If the horn is honked as the car moves with a

speed $u_S = 34\frac{m}{s}$ through still air towards a stationary receiver, the wavelength of the sound passing the receiver is [velocity of sound is $340\frac{m}{s}$]

A. 0.765 m

B. 0.850 m

C. 0.935 m

D. 0.425 m

Answer: A

Watch Video Solution

224. Spherical sound waves are emitted uniformly in all direction from a point source. The variation in sound level SL. As a function of distance r from the source can be written as where a and b are positive constants.

A. $SL = - b\log r^{a}$

B. $SL = a - b(\log r)^{2}$

C. $SL = a - b\log r$

D. $SL = \frac{a - b}{r^{2}}$

Answer: C

Watch Video Solution

225. When a person wears a hearing aid, the sound intensity level increases by 30 dB. The sound intensity increases by

A. e^2

B. 10^3

C. 30

D. 10^2

Answer: B

Watch Video Solution

226. A motorcycle starts from rest and accelerates along a straight line at $2.2\frac{m}{s^2}$. The speed of sound is $330\frac{m}{s}$. A siren at the starting point remains stationary. When the driver hears the frequency of the siren at $90\,\%$ of when motorcycle is stationary, the distance travelled by the motorcyclist is

A. `123.75 m

B. 247.5 m

C. 495 m

D. 990 m

Answer: B

Watch Video Solution

227. The difference in the speeds of sound in air at -$5^{\circ}C$, 60 cm pressure of mercury and

$30\,^{\circ}C$, 75 cm pressure of mercury is (velocity of sound in air at $0\,^{\circ}C$ is $332\frac{m}{s}$)

A. $15.25\frac{m}{s}$

B. $21.35\frac{m}{s}$

C. $18.3\frac{m}{s}$

D. $3.05\frac{m}{s}$

Answer: B

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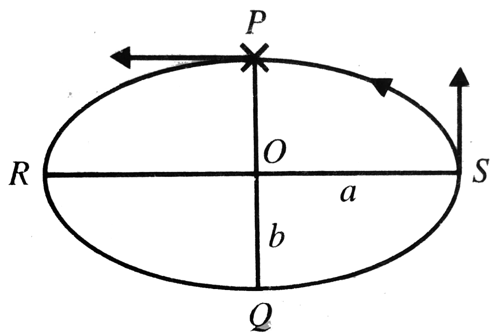


228.

A train is moving in an elliptical orbit in anticlockwise sense with a speed of $110\frac{m}{s}$. Guard is also moving in the given direction with same speed as that of train. The ratio of the length of major and minor axes is $\frac{4}{3}$. Driver blows a whistle of 1900 Hz at P, which is

received by guard at S. The frequency received by guard is (velocity of sound $v = 330\frac{m}{s}$)

A. 1900 Hz

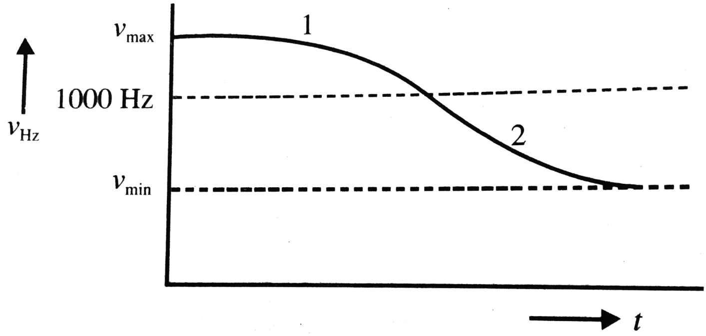
B. 1800 Hz

C. 2000 Hz

D. 1500 Hz

Answer: B

Watch Video Solution



229.

A stationary observer receives a sound from a sound of freqeuency ν_0 moving with a constant velocity $v_S = 30\frac{m}{s}$ The apparent frequency varies with time as shown in figure. Velocity of sound $v = 300\frac{m}{s}$. Then which of the following is incorrect?

A. The minimum value of apparent frequency is 889 Hz

B. The natural frequency of souce is 1000 Hz

C. The frequency time curve corresponds to a source moving at an angle to the stationary observer.

D. The maximum value of apparent frequency is 1111 Hz

Answer: A

Watch Video Solution

230. The sound from a very high burst of fireworks takes 5 s to arrive at the observer. The burst occurs 1662 m above the observer and travels vertically through two stratifier layers of air, the top one of thickness d_1 at $0^\circ C$ and the bottom one of thickness d_2 at $20^\circ C$. Then (assume velocity of sound at $0^\circ C$ is $330\frac{m}{s}$)

A. $d_1 = 342m$

B. $d_2 = 1320m$

C. $d_1 = 1485m$

D. $d_2 = 342m$

Answer: A

Watch Video Solution

231. A car emitting sound of frequency 500 Hz speeds towards a fixed wall at $4\frac{m}{s}$. An observer in the car hears both the source frequency as well as the frequency of sound reflected from

the wall. If he hears 10 beats per second between the two sounds, the velocity of sound in air will be

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

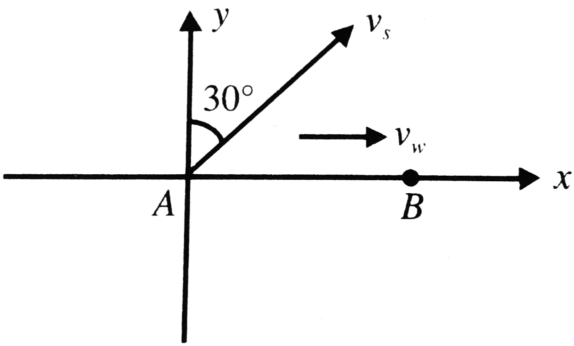
B. $387\frac{m}{s}$

C. $404\frac{m}{s}$

D. $340\frac{m}{s}$

Answer: D

Watch Video Solution



232.

In the figure shown, a source of sound of frequency 510 Hz moves with constant velocity $v_S = 20\frac{m}{s}$ in the direction shown. The wind is blowing at a constant velocity $v_W = 20\frac{m}{s}$ towards an observer who is at rest at point B. corresponding to the sound emitted by the source at initial position A, the frequency

detected by the observer is equal to (speed of sound relative to air is $330\frac{m}{s}$)

A. 510 Hz

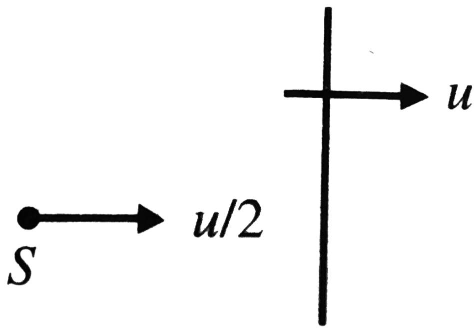
B. 500 Hz

C. 525 Hz

D. 550 Hz

Answer: C

Watch Video Solution



233.

A wall is moving with velocity u and a source of sound moves with velocity $\frac{u}{2}$ in the same direction as shown in the figure. Assuming that the sound travels with velocity $10u$, the ratio of incident sound wavelength on the wall to the reflected sound wavelength by the wall is equal to

A. $9:11$

B. $11:9$

C. $4:5$

D. $5:4$

Answer: C

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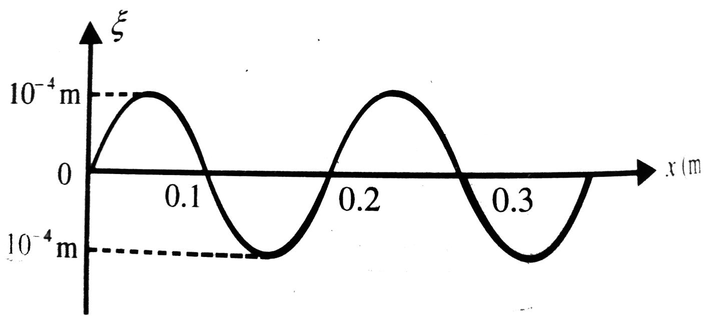
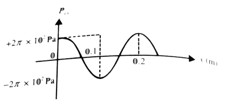
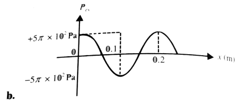
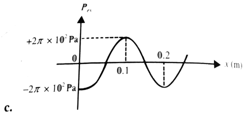


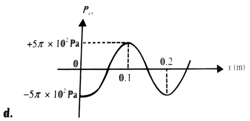
234.

For a sound wave travelling towards $+x$ direction, sinusoidal longitudinal displacement ε at a certain time is given as a function of x (Fig). If bulk modulus of air is $B = 5 \times 10^5 \frac{N}{m^2}$, the variation of pressure excess will be

A. a. 

B. 

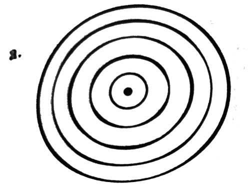
C. 

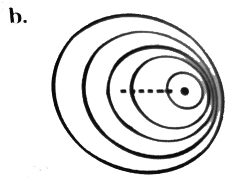
D. 

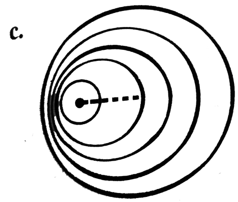
Answer: A

Watch Video Solution

235. If the source is moving towards right, wavefront of sound waves get modifies to

A. 

B. 

C. 

D. none of these

Answer: D

Watch Video Solution

236. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $f_1 \neq f_2 \neq f_3$

B. $f_1 < f_2$

C. $f_3 < f_0$

D. $f_1 < f_3 < f_2$

Answer: B

Watch Video Solution

237. When source and detector are stationary but the wind is blowing at speed v_W, the apparent wavelength λ' on the wind side is related to actual wavelength λ by [take speed of sound is air as v]

A. $\lambda' = \lambda$

B. $\lambda' = \dfrac{v_W}{v}\lambda$

C. $\lambda' = \dfrac{v_W + v}{v}\lambda$

D. $\lambda' = \dfrac{v}{v - v_W}\lambda$

Answer: C

Watch Video Solution

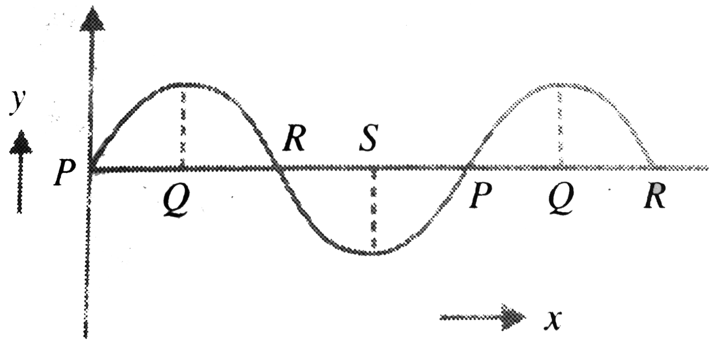
238. 

Figure. Represents the displacement y versus distance x along the direction of propagation of a longitudinal wave. The pressure is maximum at position marked

A. P

B. Q

C. R

D. S

Answer: C

Watch Video Solution

239. The driver of a car approaching a vertical wall notices that the frequency of the horn of his car changes from 400 Hz to 450 Hz after being reflected from the wall. Assuming speed of sound to be $340\frac{m}{s}$, the speed of approach of car towards the wall is

A. $10\frac{m}{s}$

B. $20\frac{m}{s}$

C. $30\frac{m}{s}$

D. $40\frac{m}{s}$

Answer: C

Watch Video Solution

240. The difference between the apparent frequency of a sound of soun as perceived by an observer during its approach and recession

is 2% of the natural frequency of the source.

If the velocity of sound in air is $300 m/s$, the velocity of the source is (It is given that velocity of source `ltlt velocity of sound)

A. $1.5\frac{m}{s}$

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

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

D. $12\frac{m}{s}$

Answer: B

Watch Video Solution

241. The frequency of a radar is 780 MHz. After getting reflected from an approaching aeroplane, the apparent frequency is more than the actual frequency by 2.6 kHz. The aeroplane has a speed of

A. $2\frac{km}{s}$

B. $1\frac{km}{s}$

C. $0.5\frac{km}{s}$

D. $0.25\frac{km}{s}$

Answer: B

Watch Video Solution

242. 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 train's speed is reduced to $17 m/s$, the frequency registered is f_2. If the speed of sound of $340 m/s$, then the ratio f_1/f_2 is

A. $\frac{18}{19}$

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

C. 2

D. $\frac{19}{18}$

Answer: C

Watch Video Solution

243. A siren placed at a railway platform is emitting sound of frequency $5kHz$. A passenger sitting in a moving train A records

a frequency of $5.5 kHz$ while the train approaches the siren. During his return journey in a different train B he records a frequency of $6.0 kHz$ while approaching the same siren. the ratio the velocity of train B to that of train A is

A. $\frac{242}{252}$

B. 2

C. $\frac{5}{6}$

D. $\frac{11}{6}$

Answer: D

Watch Video Solution

244. A person speaking normally produces a sound intensity of $40dB$ at a distance of $1m$. If the threshold intensity for reasonable audibility is $20dB$, the maximum distance at which he can be heard cleary is.

A. 4 m

B. 5 m

C. 10 m

D. 20 m

Answer: B

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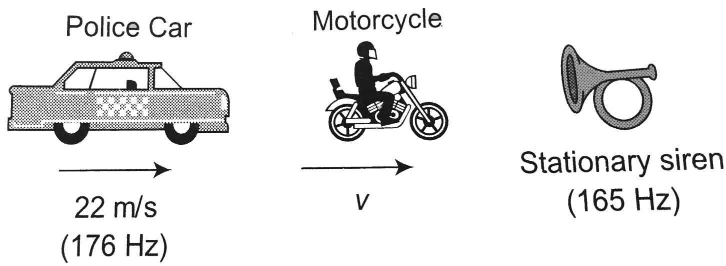
245. 

A police car moving at $22m/s$, chases a motorcyclist, the police man sounds his horn at $176Hz$, while both of them move towards a stationary siren of frequency $165Hz$. Calculate

the speed of the motorcycle, if it is given that he does not observes any beat

A. $33\frac{m}{s}$

B. $22\frac{m}{s}$

C. $11\frac{m}{s}$

D. zero

Answer: C

Watch Video Solution

246. In sport meet the timing of a 200 m straight dash is recorded at the finish point by starting an accurate stop watch on hearing the sound of starting gun firen at the starting poing. The time recorded will be more accurate

A. In winter

B. in summer

C. in all seasons

D. none of these

Answer: B

Watch Video Solution

247. When a source moves away from a stationary observer, the frequency is $\frac{6}{7}$ times the original frequency. Given: speed of sound $= 330\frac{m}{s}$. The speed of the source is

A. $40\frac{m}{s}$

B. $55\frac{m}{s}$

C. $330\frac{m}{s}$

D. $165\frac{m}{s}$

Answer: B

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248. Length of a string of density ρ and Young's modulus Y under tension is increased by $\frac{1}{n}$ times of its original length If the velocity of transverse and longitudinal vibration of the string is same, find the value of such velocity.

A. $\sqrt{\dfrac{Y}{\rho n}}$

B. $\sqrt{\dfrac{Y}{\rho^{\frac{1}{2}}}}$

C. $\sqrt{\dfrac{Y}{\rho}}$

D. $\sqrt{\dfrac{Y}{\rho n^{\frac{3}{2}}}}$

Answer: B

Watch Video Solution

249. Source and observer start moving simulatneously along x and y-axis respectively. The speed of source is twice the speed of observer V_0. If the ratio of observer frequency to the frequency of the source is 0.75, find the velocity of sound.

A. $\frac{11}{\sqrt{5}} V_0$

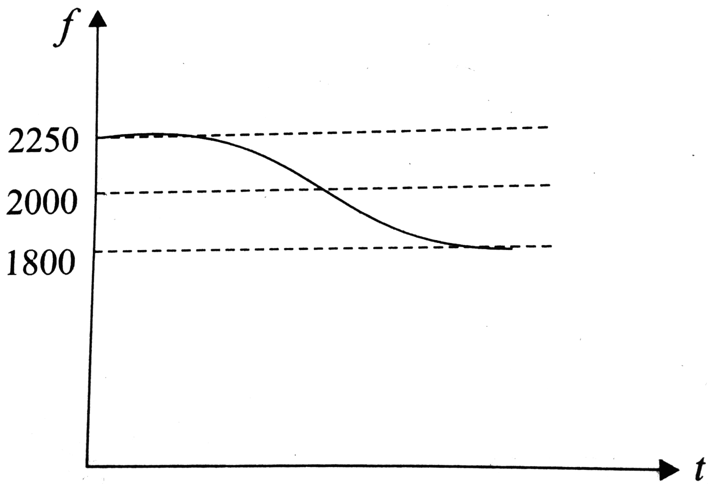
B. $\frac{17}{\sqrt{5}} V_0$

C. $\frac{16}{\sqrt{5}} V_0$

D. $\frac{19}{\sqrt{5}} V_0$

Answer: C

Watch Video Solution



250.

A statinary observer receives a sound of frequency 2000 Hz. The variation of apparent

frequency and time is shown. Find the speed of source, if velocity of sound is $300\frac{m}{s}$

A. $66.6\frac{m}{s}$

B. $33.3\frac{m}{s}$

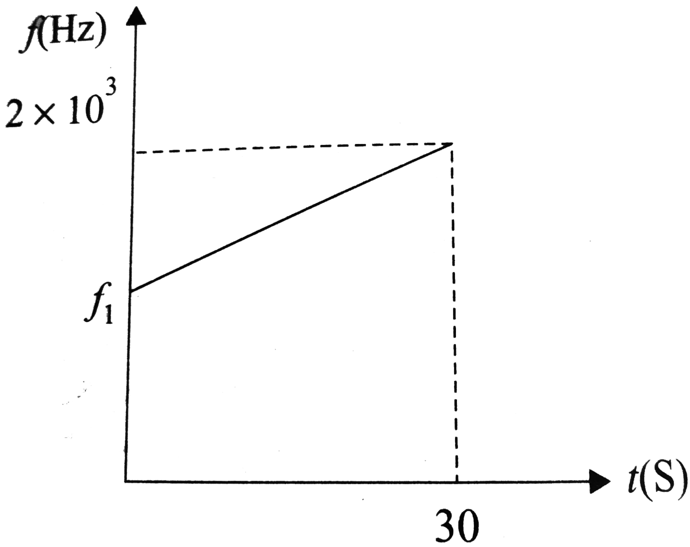
C. $27.3\frac{m}{s}$

D. $59.3\frac{m}{s}$

Answer: B

Watch Video Solution

251.



A source of sound of frequency f_1 is placed on the ground. A detector placed at a height is released from rest on this source. The observed frequency $f(Hz)$ is plotted against time $t(\text{sec})$. The speed of sound in air is $300\frac{m}{s}$.

Find f_1 ($g = 10\frac{m}{s}$).

A. $0.5 \times 10^{3} Hz$

B. $2 \times 10^{3} Hz$

C. $0.25 \times 10^{3} Hz$

D. $0.2 \times 10^{3} Hz$

Watch Video Solution

252. 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 number of wave striking the surface per second is $\frac{f((c+v))}{c}$

B. The wavelength of reflected wave is $\frac{c(c-v)}{f(c+v)}$

C. The frequency of reflected wave is $\frac{f(c+v)}{c-v}$

D. The number of beats heard by a stationary listener to the left to the

reflecting surface is $\frac{vf}{(c - v)}$

Watch Video Solution

Multiple Correct

1. Which of the following statements are incorrect?

A. Wave pulses in strings are transverse waves.

B. Sound waves in air are transverse waves of compression and rarefaction.

C. The speed of sound in air at $20^{\circ} C$ is twice that at $5^{\circ} C$.

D. A 60dB sound has twice the intensity of a 30 dB sound.

Answer: B::C::D

Watch Video Solution

2. A source S of sound wave of fixed frequency N and an observer O are located in air initially at the space points A and B, a fixed distance apart. State in which of the following cases, the observer will NOT see any Doppler effect and will receive the same frequency N as produced by the source.

A. Both the source S and observer O remain stationary but a wind blows with a constant speed in an arbitrary direction.

B. The observer remains stationary but the source S moves parallel to and in the same direction and with the same speed as the wind.

C. The source remains stationary but the observer and the wind have the same speed away from the source.

D. The source and the observer move directly against the wind but both with the same speed.

Answer: A::D

Watch Video Solution

3. A vibrating tuning fork is first held in the hand and then its end is broght in contact with a table. Which of the following statement (s) is are correct in respect of this situation?

A. The sound is louder when the tuning fork is held in hand

B. The sound is louder when the tuning fork is in contact with table.

C. The sound dies away sooner when tuning fork is brought in contact with the table.

D. The sound remains for a longer duration when turning fork is held in hand.

Answer: B::C::D

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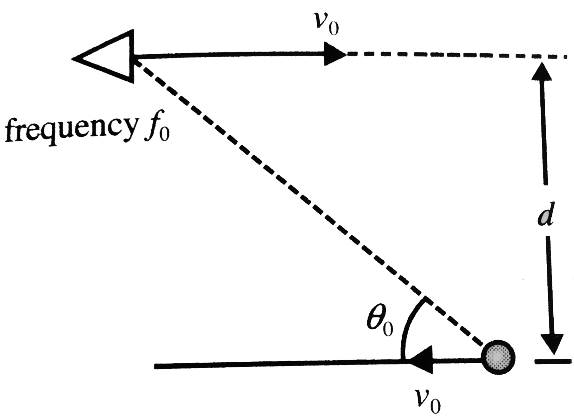


4.

A source of sound and detector are moving as shown in Fig. at $t = 0$. Take velocity of sound wave to be v. For this situation mark out the correct statement(s).

A. The frequency received by the detector is always greater than f_0

B. Initially, frequency received by the detector is greater than f_0, becomes equal to f_0, and then decreases with the time.

C. Frequency received by the detector is equal to f_0 at $t = \frac{d\cot\theta_0}{\left(2v_0\right)}$.

D. Frequency received by the detector can never be equal to f_0

Answer: B::C

Watch Video Solution

5. Which of the following statements are correct?

A. Changes in air temperature have no effect on the speed of sound.

B. Changes in air pressure have no effect on the speed of sound.

C. The speed of sound in water is lower than in air.

D. None of these

Answer: B

Watch Video Solution

6. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D

approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is

the same. For this situation which is incorrect?

A. $n_1 = n_2 = n_3$

B. $n_1 < n_2$

C. $n_3 > n_0$

D. n_3 lies between n_1 and n_2

Answer: B::C::D

Watch Video Solution

7. An observer A is moving directly towards a stationary sound source while another observer B is moving away from the source with the same velocity. Which of the following statements are correct?

A. Average of freqeuncies recorded by A and B is equal to natural frequency of the source

B. Wavelength of wave received by A is less than that of waves received by B.

C. Wavelength of waves received by two observers will be same.

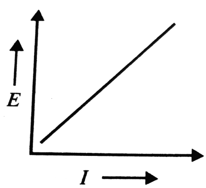
D. Both the observers will observe the wave travelling with same speed.

Answer: A::C

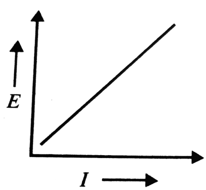
Watch Video Solution

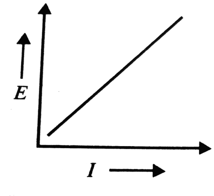
8. A sonic source, located in a uniform medium, emits waves of frequency n. If intensity, energy density (energy per unit volume of the medium) and maximum speed of oscillations of medium particle are, respectively, I, E and u_0 at a point, then which of the following graphs are correct?

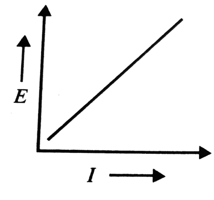
A. a.



B. a.



C. a. 

D. a. 

Answer: A::C::D

Watch Video Solution

9. Plane harmonic waves of frequency 500 Hz are produced in air with displacement amplitude of $10\mu m$. Given that density of air is

$1.29\frac{kg}{m^3}$ and speed of sound in air is $340\frac{m}{s}$.

Then

A. the pressure amplitude is $13.8\frac{N}{m^2}$

B. the energy density is $6.4 \times 10^{-4}\frac{J}{m^3}$

C. the energy flux is $0.22\frac{J}{(m^2 s)}$

D. only (a) and (c) are correct

Answer: A::B::C

Watch Video Solution

10. A driver in a stationary car blows a horn which produces monochromatic sound waves of freqeuncy 1000 Hz normally towards a reflecting wall. The wall approaches the car with a speed of $3.3 \frac{m}{s}$.

A. The frequency of sound reflected from wall and heard by the driver is 1020 Hz

B. The frequency of sound reflected from wall and heard by the deriver is 980 Hz

C. The percentage increase in frequency of sound after reflection from wall is 2%

D. The percentage decrease in freqeuncy of sound after reflection from wall is 2%

Answer: A::C

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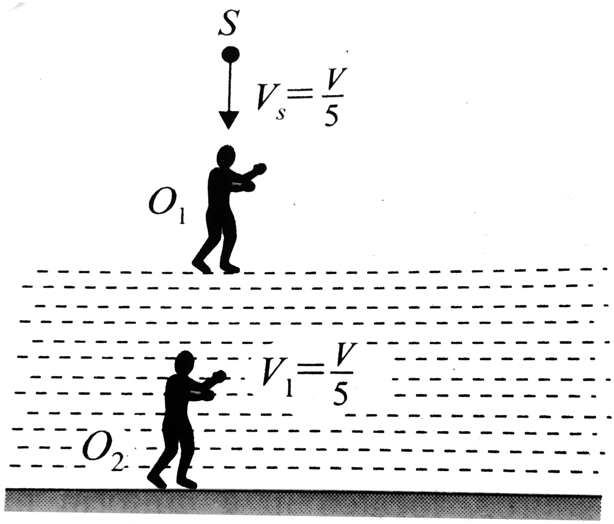

11.

In the figure shown, an observer O_1 floats (static) on water surface with ears in air while another observer O_2 is moving upwards with constant velocity $V_1 = \frac{V}{5}$ in water. The source moves down with constant velocity $V_S = \frac{V}{5}$ and emits sound of freqeuncy f. The velocity of

sound in air is V and that in water is $4V$. For the situation shown in figure.

A. The wavelength of the sound received by O_1 is $\frac{4V}{5f}$

B. The wavelength of the sound received by O_1 is $\frac{V}{f}$

C. The frequency of the sound received by O_2 is $\frac{21f}{16}$

D. The wavelength of the sound received by O_2 is $\frac{16V}{5f}$

Answer: A::C::D

Watch Video Solution

12. Which of the following statements are incorrect?

A. Wave pulses in strings are transverse waves.

B. Sound waves in air are transverse waves of compression and rarefaction.

C. The speed of sound in air at $20^{\circ}C$ is twice that at $5^{\circ}C$.

D. A 60dB sound has twice the intensity of a 30 dB sound.

Answer: B::C::D

Watch Video Solution

13. A source S of sound wave of fixed frequency N and an observer O are located in air initially at the space points A and B, a fixed distance apart. State in which of the following cases, the observer will NOT see any Doppler effect and will receive the same frequency N as produced by the source.

A. Both the source S and observer O remain stationary but a wind blows with a constant speed in an arbitrary direction.

B. The observer remains stationary but the source S moves parallel to and in the

same direction and with the same speed as the wind.

C. The source remains stationary but the observer and the wind have the same speed away from the source.

D. The source and the observer move directly against the wind but both with the same speed.

Answer: A::D

Watch Video Solution

14. A vibrating tuning fork is first held in the hand and then its end is broght in contact with a table. Which of the following statement (s) is are correct in respect of this situation?

A. The sound is louder when the tuning fork is held in hand

B. The sound is louder when the tuning fork is in contact with table.

C. The sound dies away sooner when tuning fork is brought in contact with the table.

D. The sound remains for a longer duration when turning fork is held in hand.

Answer: B::C::D

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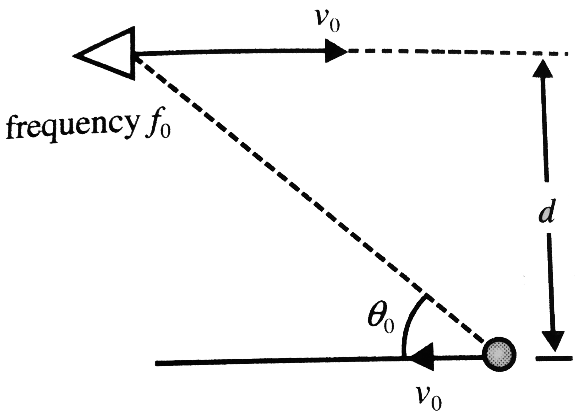

15.

A source of sound and detector are moving as shown in Fig. at $t = 0$. Take velocity of sound wave to be v. For this situation mark out the correct statement(s).

A. The frequency received by the detector is always greater than f_0

B. Initially, frequency received by the detector is greater than f_0, becomes equal to f_0, and then decreases with the time.

C. Frequency received by the detector is equal to f_0 at $t = \frac{d\cot\theta_0}{(2v_0)}$.

D. Frequency received by the detector can never be equal to f_0

Answer: B::C

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16. Which of the following statements are correct?

A. Changes inair temperature have no effect on the speed of sound.

B. Changes in air pressure have no effect on the speed of sound.

C. The speed of sound in water is higher that in air.

D. The speed of sound in water is lower than in air.

Answer: B::C

Watch Video Solution

17. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $n_1 = n_2 = n_3$

B. $n_1 < n_2$

C. $n_3 > n_0$

D. n_3 lies between n_1 and n_2

Answer: B::C::D

Watch Video Solution

18. An observer A is moving directly towards a stationary sound source while another observer B is moving away from the source with the same velocity. Which of the following statements are correct?

A. Average of freqeuncies recorded by A and B is equal to natural frequency of the source

B. Wavelength of wave received by A is less than that of waves received by B.

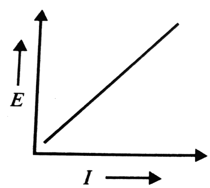
C. Wavelength of waves received by two observers will be same.

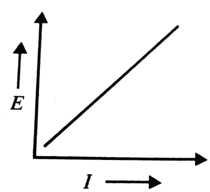
D. Both the observers will observe the wave travelling with same speed.

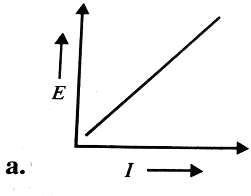
Answer: A::C

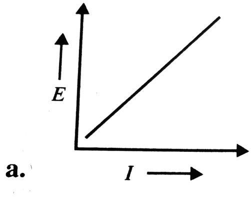
Watch Video Solution

19. A sonic source, located in a uniform medium, emits waves of frequency n. If intensity, energy density (energy per unit volume of the medium) and maximum speed of oscillations of medium particle are, respectively, I, E and u_0 at a point, then which of the following graphs are correct?

A. a. 

B. a. 

C. 

D. 

Answer: A::C::D

Watch Video Solution

20. Plane harmonic waves of frequency 500 Hz are produced in air with displacement amplitude of $10\mu m$. Given that density of air is

$1.29\frac{kg}{m^3}$ and speed of sound in air is $340\frac{m}{s}$.

Then

A. the pressure amplitude is $13.8\frac{N}{m^2}$

B. the energy density is $6.4 \times 10^{-4}\frac{J}{m^3}$

C. the energy flux is $0.22\frac{J}{\left(m^2 s\right)}$

D. only (a) and (c) are correct

Answer: A::B::C

Watch Video Solution

21. A driver in a stationary car blows a horn which produces monochromatic sound waves of freqeuncy 1000 Hz normally towards a reflecting wall. The wall approaches the car with a speed of $3.3\frac{m}{s}$.

A. The frequency of sound reflected from wall and heard by the driver is 1020 Hz

B. The frequency of sound reflected from wall and heard by the deriver is 980 Hz

C. The percentage increase in frequency of sound after reflection from wall is 2%

D. The percentage decrease in freqeuncy of sound after reflection from wall is 2%

Answer: A::C

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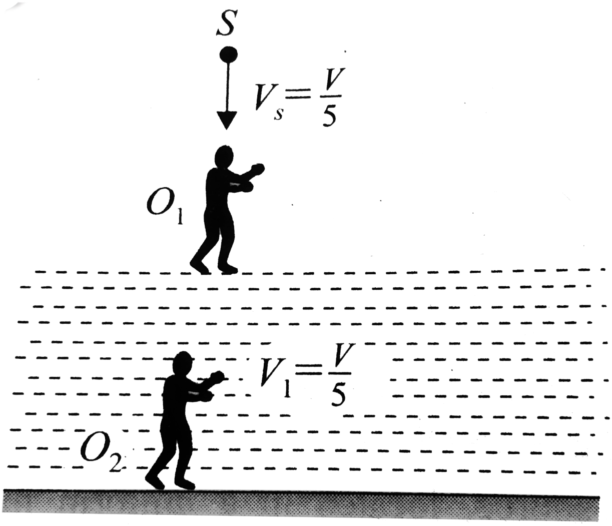
22. 

In the figure shown, an observer O_1 floats (static) on water surface with ears in air while another observer O_2 is moving upwards with constant velocity $V_1 = \frac{V}{5}$ in water. The source moves down with constant velocity $V_S = \frac{V}{5}$ and emits sound of freqeuncy f. The velocity of

sound in air is V and that in water is $4V$. For the situation shown in figure.

A. The wavelength of the sound received by O_1 is $\frac{4V}{5f}$

B. The wavelength of the sound received by O_1 is $\frac{V}{f}$

C. The frequency of the sound received by O_2 is $\frac{21f}{16}$

D. The wavelength of the sound received by O_2 is $\frac{16V}{5f}$

Answer: A::C::D

Watch Video Solution

23. Which of the following statements are incorrect?

A. Wave pulses in strings are transverse waves.

B. Sound waves in air are transverse waves of compression and rarefaction.

C. The speed of sound in air at $20^{\circ}C$ is twice that at $5^{\circ}C$.

D. A 60dB sound has twice the intensity of a 30 dB sound.

Answer: B::C::D

Watch Video Solution

24. A source S of sound wave of fixed frequency N and an observer O are located in air initially at the space points A and B, a fixed distance apart. State in which of the following cases, the observer will NOT see any Doppler effect and will receive the same frequency N as produced by the source.

A. Both the source S and observer O remain stationary but a wind blows with a constant speed in an arbitrary direction.

B. The observer remains stationary but the source S moves parallel to and in the

same direction and with the same speed as the wind.

C. The source remains stationary but the observer and the wind have the same speed away from the source.

D. The source and the observer move directly against the wind but both with the same speed.

Answer: A::D

Watch Video Solution

25. A vibrating tuning fork is first held in the hand and then its end is broght in contact with a table. Which of the following statement (s) is are correct in respect of this situation?

A. The sound is louder when the tuning fork is held in hand

B. The sound is louder when the tuning fork is in contact with table.

C. The sound dies away sooner when tuning fork is brought in contact with the table.

D. The sound remains for a longer duration when turning fork is held in hand.

Answer: B::C::D

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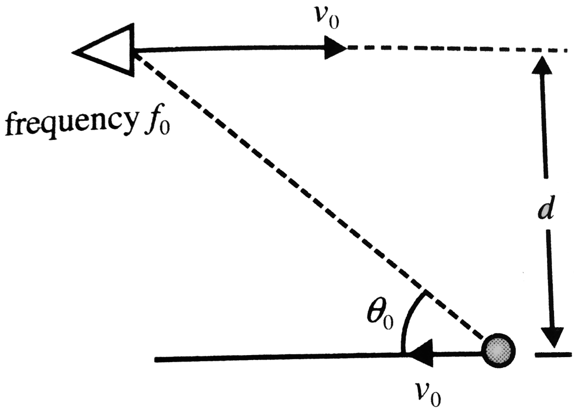

26.

A source of sound and detector are moving as shown in Fig. at $t = 0$. Take velocity of sound wave to be v. For this situation mark out the correct statement(s).

A. The frequency received by the detector is always greater than f_0

B. Initially, frequency received by the detector is greater than f_0, becomes equal to f_0, and then decreases with the time.

C. Frequency received by the detector is equal to f_0 at $t = \frac{d\cot\theta_0}{(2v_0)}$.

D. Frequency received by the detector can never be equal to f_0

Answer: B::C

Watch Video Solution

27. Which of the following statements are correct?

A. Changes inair temperature have no effect on the speed of sound.

B. Changes in air pressure have no effect on the speed of sound.

C. The speed of sound in water is higher that in air.

D. The speed of sound in water is lower than in air.

Answer: B::C

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28. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $n_1 = n_2 = n_3$

B. $n_1 < n_2$

C. $n_3 > n_0$

D. n_3 lies between n_1 and n_2

Answer: B::C::D

Watch Video Solution

29. An observer A is moving directly towards a stationary sound source while another observer B is moving away from the source with the same velocity. Which of the following statements are correct?

A. Average of freqeuncies recorded by A and B is equal to natural frequency of the source

B. Wavelength of wave received by A is less than that of waves received by B.

C. Wavelength of waves received by two observers will be same.

D. Both the observers will observe the wave travelling with same speed.

Answer: A::C

Watch Video Solution

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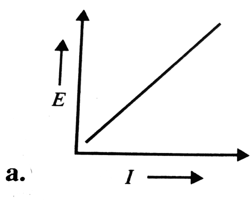
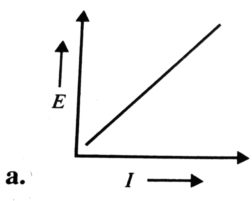
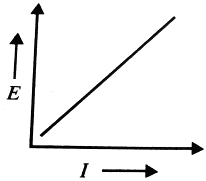
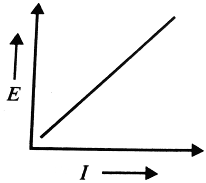
A. 

B. 

C. a. 

D. a. 

Answer: A::C::D

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31. Plane harmonic waves of frequency 500 Hz are produced in air with displacement amplitude of $10\mu m$. Given that density of air is

$1.29\frac{kg}{m^3}$ and speed of sound in air is $340\frac{m}{s}$.

Then

A. the pressure amplitude is $13.8\frac{N}{m^2}$

B. the energy density is $6.4 \times 10^{-4}\frac{J}{m^3}$

C. the energy flux is $0.22\frac{J}{\left(m^2 s\right)}$

D. only (a) and (c) are correct

Answer: A::B::C

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32. A driver in a stationary car blows a horn which produces monochromatic sound waves of freqeuncy 1000 Hz normally towards a reflecting wall. The wall approaches the car with a speed of $3.3\frac{m}{s}$.

A. The frequency of sound reflected from wall and heard by the driver is 1020 Hz

B. The frequency of sound reflected from wall and heard by the deriver is 980 Hz

C. The percentage increase in frequency of sound after reflection from wall is 2%

D. The percentage decrease in freqeuncy of sound after reflection from wall is 2%

Answer: A::C

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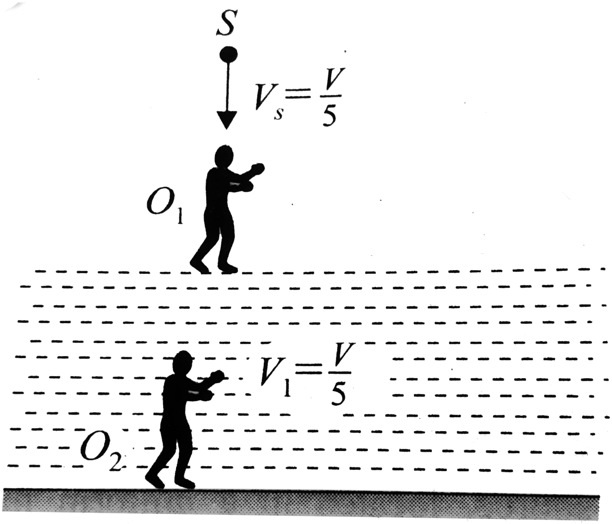

33.

In the figure shown, an observer O_1 floats (static) on water surface with ears in air while another observer O_2 is moving upwards with constant velocity $V_1 = \frac{V}{5}$ in water. The source moves down with constant velocity $V_S = \frac{V}{5}$ and emits sound of freqeuncy f. The velocity of

sound in air is V and that in water is $4V$. For the situation shown in figure.

A. The wavelength of the sound received by O_1 is $\frac{4V}{5f}$

B. The wavelength of the sound received by O_1 is $\frac{V}{f}$

C. The frequency of the sound received by O_2 is $\frac{21f}{16}$

D. The wavelength of the sound received by O_2 is $\frac{16V}{5f}$

Answer: A::C::D

Watch Video Solution

34. Which of the following statements are incorrect?

A. Wave pulses in strings are transverse waves.

B. Sound waves in air are transverse waves of compression and rarefaction.

C. The speed of sound in air at $20^{\circ} C$ is twice that at $5^{\circ} C$.

D. A 60dB sound has twice the intensity of a 30 dB sound.

Answer: B::C::D

Watch Video Solution

35. A source S of sound wave of fixed frequency N and an observer O are located in air initially at the space points A and B, a fixed distance apart. State in which of the following cases, the observer will NOT see any Doppler effect and will receive the same frequency N as produced by the source.

A. Both the source S and observer O remain stationary but a wind blows with a constant speed in an arbitrary direction.

B. The observer remains stationary but the source S moves parallel to and in the

same direction and with the same speed as the wind.

C. The source remains stationary but the observer and the wind have the same speed away from the source.

D. The source and the observer move directly against the wind but both with the same speed.

Answer: A::D

Watch Video Solution

36. A vibrating tuning fork is first held in the hand and then its end is broght in contact with a table. Which of the following statement (s) is are correct in respect of this situation?

A. The sound is louder when the tuning fork is held in hand

B. The sound is louder when the tuning fork is in contact with table.

C. The sound dies away sooner when tuning fork is brought in contact with the table.

D. The sound remains for a longer duration when turning fork is held in hand.

Answer: B::C::D

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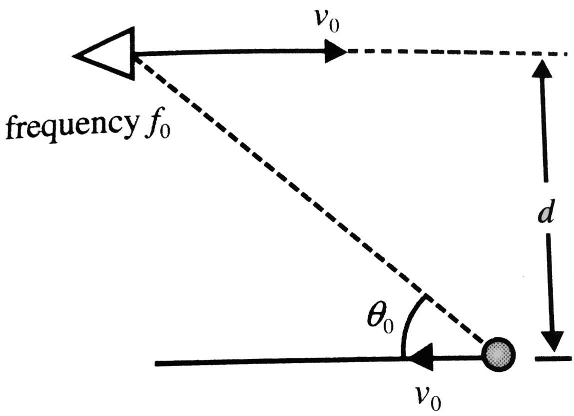

37.

A source of sound and detector are moving as shown in Fig. at $t = 0$. Take velocity of sound wave to be v. For this situation mark out the correct statement(s).

A. The frequency received by the detector is always greater than f_0

B. Initially, frequency received by the detector is greater than f_0, becomes equal to f_0, and then decreases with the time.

C. Frequency received by the detector is equal to f_0 at $t = \frac{d\cot\theta_0}{(2v_0)}$.

D. Frequency received by the detector can never be equal to f_0

Answer: B::C

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38. Which of the following statements are correct?

A. Changes inair temperature have no effect on the speed of sound.

B. Changes in air pressure have no effect on the speed of sound.

C. The speed of sound in water is higher that in air.

D. The speed of sound in water is lower than in air.

Answer: B::C

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39. Consider a souce of sound S, and an observer/detector D. The source emits a sound wave of frequency f_0. The frequency observed by D is found to be (i) f_1, if D approaches S and S is stationary

(ii) f_2, if S approaches S and S is stationary

(iii) f_3,if both S and D and D is stationary

Speed

In all three cases, relative velocity of S wrt D is the same. For this situation which is incorrect?

A. $n_1 = n_2 = n_3$

B. $n_1 < n_2$

C. $n_3 > n_0$

D. n_3 lies between n_1 and n_2

Answer: B::C::D

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40. An observer A is moving directly towards a stationary sound source while another observer B is moving away from the source with the same velocity. Which of the following statements are correct?

A. Average of freqeuncies recorded by A and B is equal to natural frequency of the source

B. Wavelength of wave received by A is less than that of waves received by B.

C. Wavelength of waves received by two observers will be same.

D. Both the observers will observe the wave travelling with same speed.

Answer: A::C

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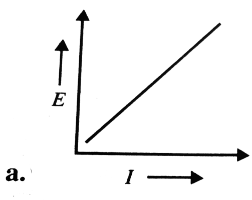
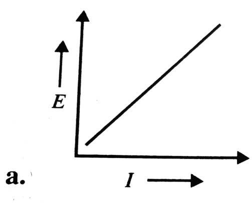
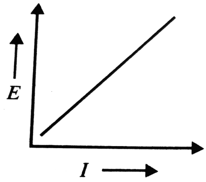
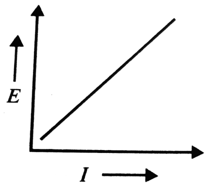
41. A sonic source, located in a uniform medium, emits waves of frequency n. If intensity, energy density (energy per unit volume of the medium) and maximum speed of oscillations of medium particle are, respectively, I, E and u_0 at a point, then which of the following graphs are correct?

A. 

B. 

C. a. 

D. a. 

Answer: A::C::D

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42. Plane harmonic waves of frequency 500 Hz are produced in air with displacement amplitude of $10\mu m$. Given that density of air is

$1.29 \frac{kg}{m^3}$ and speed of sound in air is $340 \frac{m}{s}$.

Then

A. the pressure amplitude is $13.8 \frac{N}{m^2}$

B. the energy density is $6.4 \times 10^{-4} \frac{J}{m^3}$

C. the energy flux is $0.22 \frac{J}{\left(m^2 s\right)}$

D. only (a) and (c) are correct

Answer: A::B::C

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43. A driver in a stationary car blows a horn which produces monochromatic sound waves of freqeuncy 1000 Hz normally towards a reflecting wall. The wall approaches the car with a speed of $3.3\frac{m}{s}$.

A. The frequency of sound reflected from wall and heard by the driver is 1020 Hz

B. The frequency of sound reflected from wall and heard by the deriver is 980 Hz

C. The percentage increase in frequency of sound after reflection from wall is 2%

D. The percentage decrease in freqeuncy of sound after reflection from wall is 2%

Answer: A::C

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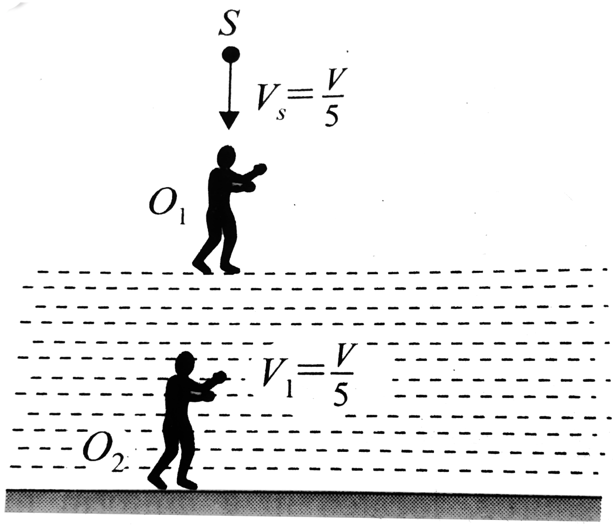

44.

In the figure shown, an observer O_1 floats (static) on water surface with ears in air while another observer O_2 is moving upwards with constant velocity $V_1 = \frac{V}{5}$ in water. The source moves down with constant velocity $V_S = \frac{V}{5}$ and emits sound of freqeuncy f. The velocity of

sound in air is V and that in water is $4V$. For the situation shown in figure.

A. The wavelength of the sound received by O_1 is $\frac{4V}{5f}$

B. The wavelength of the sound received by O_1 is $\frac{V}{f}$

C. The frequency of the sound received by O_2 is $\frac{21f}{16}$

D. The wavelength of the sound received by O_2 is $\frac{16V}{5f}$

Answer: A::C::D

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Assertion-Reasoning

1. Statement I: A tuning fork is considered as a source of an acoustic wave of a single frequency as marked on its body. Statement II: The tuning fork cannot produce any of its harmonics due to its special nature of construction.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: A

Watch Video Solution

2. Statement I: The apparent freqeuncy which is the frequency as noted by an observer or an observing detection device of the acoustic wave that moves from the source to the observer propagating in a medium may be different from its true frequency.

Statement II: A source in motion relative to an observer sends out less or more number of waves per metre distance in the medium and an observer in motion collects less or more number of waves per second that when both of them remain at rest relatively.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

3. Statement I: If two people talk simulaneously and each creates an intensity of 60 dB at a point P, then total intensity level at the point P is 120 dB

Statement II: sound level is defined on a non-linear scale.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

4. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

5. Statement I: A 80 dB sound has twice the intensity of a 40 dB sound.

Statement II: Loudness of a sound of a certain intensity I is defined as

$$L(\text{in } dB) = 10\log_{10} = \frac{I}{I_0}$$

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation

for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

6. Statement I: A person is standing near a railway trach. A train is moving on the track. As the train is approaching the person, apparent freqeuncy keeps on increasing and when the train has passed the person, then apparent frequency keeps on decreasing.

Statement II: When train is approaching the person then,

$$f = f_0\left[\frac{c}{c - u}\right]$$

and when train is moving away from person

$$f = f_0\left[\frac{c}{c + u}\right]$$

Here, c is velocity of sound u is velocity of train and f_0 is original frequency of whistle.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

7. $Statement I$: A tuning fork is considered as a source of an acoustic wave of a single frequency as marked on its body.

$Statement II$: The tuning fork cannot produce any of its harmonics due to its special nature of construction.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: A

Watch Video Solution

8. Statement I: The apparent freqeuncy which is the frequency as noted by an observer or an observing detection device of the acoustic wave that moves from the source to the observer propagating in a medium may be different from its true frequency.

Statement II: A source in motion relative to an observer sends out less or more number of waves per metre distance in the medium and an observer in motion collects less or more number of waves per second that when both of them remain at rest relatively.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

9. **Statement I:** If two people talk simulaneously and each creates an intensity of 60 dB at a point P, then total intensity level at the point P is 120 dB

Statement II: sound level is defined on a non-linear scale.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

10. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation

for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

11. Statement I: A 80 dB sound has twice the intensity of a 40 dB sound.

Statement II: Loudness of a sound of a certain intensity I is defined as

$$L(\text{in } dB) = 10\log_{10}\left(\frac{I}{I_0}\right)$$

A. Statement I is true, Statement II is true:

Statement II is a correct explanation for

statement I.

B. Statement I is true, Statement II is true,

Statement II is NOT a correct explanation

for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

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12. Statement I: A person is standing near a railway track. A train is moving on the track. As the train is approaching the person, apparent frequency keeps on increasing and when the train has passed the person, then apparent frequency keeps on decreasing.

Statement II: When train is approaching the person then,

$$f = f_0\left[\frac{c}{c - u}\right]$$

and when train is moving away from person

$$f = f_0\left[\frac{c}{c + u}\right]$$

Here, c is velocity of sound u is velocity of train

and f_0 is original frequency of whistle.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation

for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

13. $StatementI$: A tuning fork is considered as a source of an acoustic wave of a single frequency as marked on its body.

$StatementII$: The tuning fork cannot produce any of its harmonics due to its special nature of construction.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: A

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14. Statement I: The apparent freqeuncy which is the frequency as noted by an observer or an observing detection device of the acoustic wave that moves from the source to the observer propagating in a medium may be different from its true frequency.

Statement II: A source in motion relative to an observer sends out less or more number of waves per metre distance in the medium and an observer in motion collects less or more number of waves per second that when both of them remain at rest relatively.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

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15. Statement I: If two people talk simulaneously and each creates an intensity of 60 dB at a point P, then total intensity level at the point P is 120 dB

Statement II: sound level is defined on a non-linear scale.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

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16. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

17. Statement I: A 80 dB sound has twice the intensity of a 40 dB sound.

Statement II: Loudness of a sound of a certain intensity I is defined as

$$L(\text{in } dB) = 10\log_{10}\left(\frac{I}{I_0}\right)$$

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

18. Statement I: A person is standing near a railway track. A train is moving on the track. As the train is approaching the person, apparent frequency keeps on increasing and when the train has passed the person, then apparent frequency keeps on decreasing.

Statement II: When train is approaching the person then,

$$f = f_0\left[\frac{c}{c - u}\right]$$

and when train is moving away from person

$$f = f_0\left[\frac{c}{c + u}\right]$$

Here, c is velocity of sound u is velocity of train and f_0 is original frequency of whistle.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

19. $Statement I$: A tuning fork is considered as a source of an acoustic wave of a single frequency as marked on its body.

$Statement II$: The tuning fork cannot produce any of its harmonics due to its special nature of construction.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: A

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20. Statement I: The apparent freqeuncy which is the frequency as noted by an observer or an observing detection device of the acoustic wave that moves from the source to the observer propagating in a medium may be different from its true frequency.

Statement II: A source in motion relative to an observer sends out less or more number of waves per metre distance in the medium and an observer in motion collects less or more number of waves per second that when both of them remain at rest relatively.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

21. Statement I: If two people talk simulaneously and each creates an intensity of 60 dB at a point P, then total intensity level at the point P is 120 dB

Statement II: sound level is defined on a non-linear scale.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

22. Statement I: Intensity of sound wave changes when the listener moves towards or away from the stationary source.

Statement II: The motion of listener causes the apparent change in wavelength.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: C

Watch Video Solution

23. Statement I: A 80 dB sound has twice the intensity of a 40 dB sound.

Statement II: Loudness of a sound of a certain intensity I is defined as

$$L(\text{in } dB) = 10\log_{10}\left(\frac{I}{I_0}\right)$$

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

Watch Video Solution

24. Statement I: A person is standing near a railway track. A train is moving on the track. As the train is approaching the person, apparent frequency keeps on increasing and when the train has passed the person, then apparent frequency keeps on decreasing.

Statement II: When train is approaching the person then,

$$f = f_0\left[\frac{c}{c - u}\right]$$

and when train is moving away from person

$$f = f_0\left[\frac{c}{c + u}\right]$$

Here, c is velocity of sound u is velocity of train and f_0 is original frequency of whistle.

A. Statement I is true, Statement II is true: Statement II is a correct explanation for statement I.

B. Statement I is true, Statement II is true, Statement II is NOT a correct explanation for Statement I.

C. Statement I is true, Statement II is false

D. Statement I is falce: Statement II is true

Answer: D

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Comprehension

1. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener in front of the train?

A. $547.6Hz$

B. $690.6Hz$

C. $590.9Hz$

D. $520.3Hz$

Answer: A

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2. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener behind the train?

A. $420Hz$

B. $460Hz$

C. $480Hz$

D. $430Hz$

Answer: B

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3. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The beat frequency recorded by the receiver is

A. $110Hz$

B. $210Hz$

C. $150Hz$

D. $220Hz$

Answer: A

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4. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of direct waves received by the receiver is

A. $50cm$

B. $100cm$

C. $150cm$

D. $90cm$

Answer: A

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5. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall $\rightarrow$ source $\rightarrow$ receiver. If

velocity of osund propagation is $v = 330\frac{m}{s}$,

then

Q. The wavelength of reflected waves received by the receiver is

A. $120cm$

B. $50cm$

C. $90cm$

D. $60cm$

Answer: D

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6. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω. The velocity of sound in air is $v = 340\frac{m}{s}$.

Q. If $\omega = 10\frac{m}{s^2}$, the apparent frequency that will be recorded by the stationary receiver at $t = 10s$ will be

A. $1700Hz$

B. $1.35Hz$

C. $850Hz$

D. $1.27Hz$

Answer: B

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7. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω. The velocity of sound in air is $v = 340\frac{m}{s}$.

If $\omega = 10\frac{m}{s^2}$ for 10s and then $\omega = 0$ for $t > 10s$, the apparent frequency recorded by the receiver at $t = 15s$

A. $1700Hz$

B. $1313Hz$

C. $850Hz$

D. $1.23Hz$

Answer: B

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8. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer situated at a great distance on a straight line perpendicular to the plane of the circle, through its centre, the apparent frequency of the source will be

A. greater that 500 Hx

B. smaller than 500 Hz

C. always remain 500 Hz

D. greater for half the circle and smaller during the other half

Answer: C

Watch Video Solution

9. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For half the circle and smaller during the other half for an observer who is at rest at a great distance from the centre of the circle but nearly in the same plane, the minimum $f_{\min}$ and the maximum $f_{\max}$ of the range of values of the apparent frequency heard by him will be

A. $f_{\min} = 455Hz, f_{\max} = 535Hz$

B. $f_{\min} = 484Hz, f_{\max} = 515Hz$

C. $f_{\min} = 484Hz, f_{\max} = 500Hz$

D. $f_{\min} = 500Hz, f_{\max} = 515Hz$

Answer: B

Watch Video Solution

10. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. If the observer moves towards the source with a constant speed of $20\frac{m}{s}$, along the radial line to the centre, the fractional change in the apparent frequency over the frequency that the source will have if considered at reat at the centre will be

A. $6\,\%$

B. $3\,\%$

C. $2\,\%$

D. $9\,\%$

Answer: A

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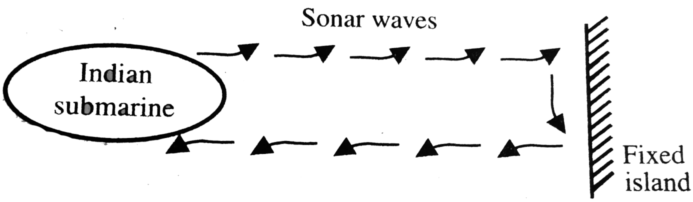
11. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to

be 10% greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes 21% greater than the sent waves.

Q. The speed of indian submarine is



A. $10\frac{m}{s}$

B. $50\frac{m}{s}$

C. $100\frac{m}{s}$

D. $20\frac{m}{s}$

Answer: B

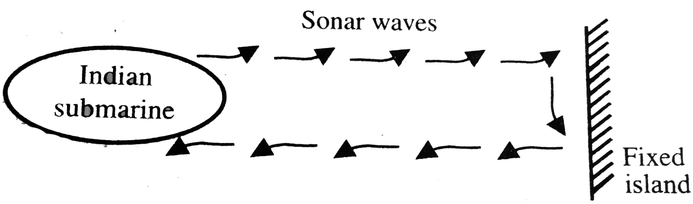
Watch Video Solution

12. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to

submarine. The frequency of reflected waves are detected by the submarine and found to be 10% greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes 21% greater than the sent waves.

Q. The velocity of enemy ship should be



A. $50\frac{m}{s}$ towards indian submarine

B. $50\frac{m}{s}$ away from indian submarine

C. $100\frac{m}{2}$ towards indian submarine

D. $100\frac{m}{s}$ away from indian submarine

Answer: A

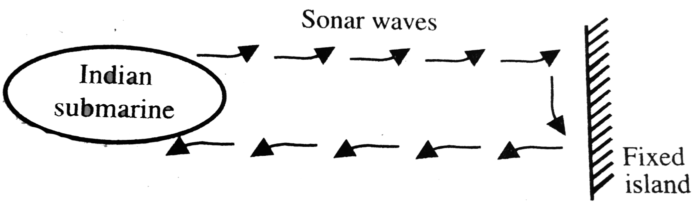
Watch Video Solution

13. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes $21\,\%$ greater than the sent waves.

Q If the wavelength received by enemy ship is λ' and wavelength of reflected waves received

by submarine is λ'', then $\left(\frac{\lambda'}{\lambda''}\right)$ equals



A. 1

B. 1.1

C. 1.2

D. 2

Answer: B

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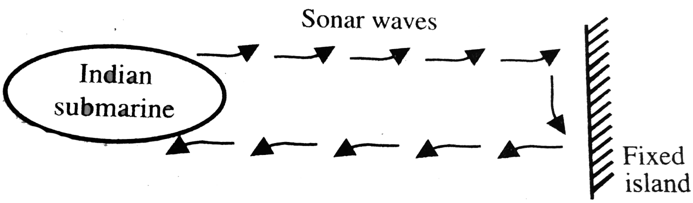
14. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves

detected by submarine becomes 21 % greater than the sent waves.

Q. Bulk modulus of sea water should be approximately $\left(\rho =_{water} = 1000\frac{kg}{m^3}\right)$



A. $10^8\frac{N}{m^2}$

B. $10^9\frac{N}{m^2}$

C. $10^{10}\frac{N}{m^2}$

D. $10^{11}\frac{N}{m^2}$

Answer: B

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15. Due to point isotropic sound source, theintensity at a point is observed as 40 dB. The density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The pressure amplitude at the observation point is

A. $3\frac{N}{m^2}$

B. $3 \times 10^3 \frac{N}{m^2}$

C. $3 \times 10^{-3} \frac{N}{m^2}$

D. $6 \times 10^{-2} \frac{N}{m^2}$

Answer: C

Watch Video Solution

16. Due to point isotropic sound source, theintensity at a point is observed as 40 dB.

The density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The ratio of displacement amplitude of wave at observation point to wavelength of sound waves is

A. 3.22×10^{-6}

B. 3.22×10^{-12}

C. 3.22×10^{-9}

D. 1.07×10^{-10}

Answer: C

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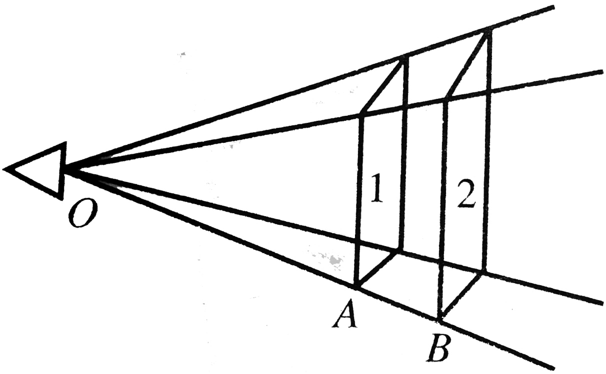

17. In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2

having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. find the intensity at both the surfaces.

A. $I_1 = 12 \times 10^{-6} \frac{W}{m^2}, I_2 = 12 \times 10^{-6} \frac{W}{m^2}$

B. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 12 \times 10^{-9} \frac{W}{m^2}$

C. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

D. $I_1 = 12 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

Answer: C

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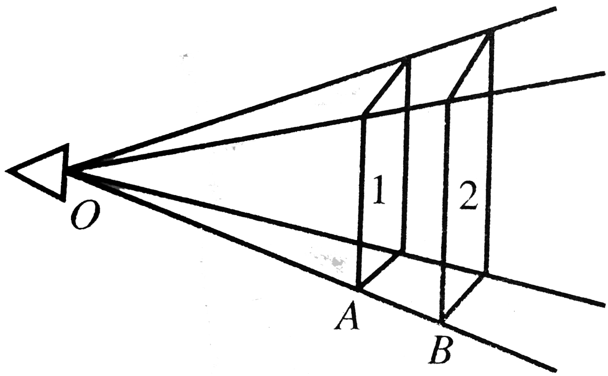

18.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. If two persons (having almost same physique) A and B are standing at the location

of surfaces 1 and 2, respectively, then who will hear a quiter sound?

A. Both will hear same sound.

B. A will bear a quiter sound

C. B will hear a quiter sound

D. information is not sufficient

Answer: C

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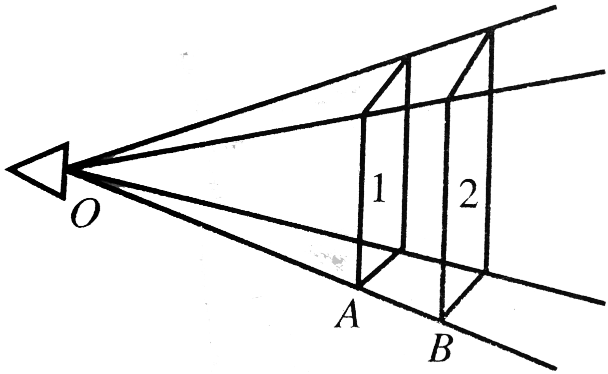

19.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. Let the areas of the eardrums of persons A and B be $A_A = 2mm^2$ and $A_B = 4mm^2$,

respectively. Then who will hear a quiter sound?

A. A will hear a quiter sound.

B. B will hear quiter sound

C. Both will hear the same sound.

D. Cannot say anything.

Answer: C

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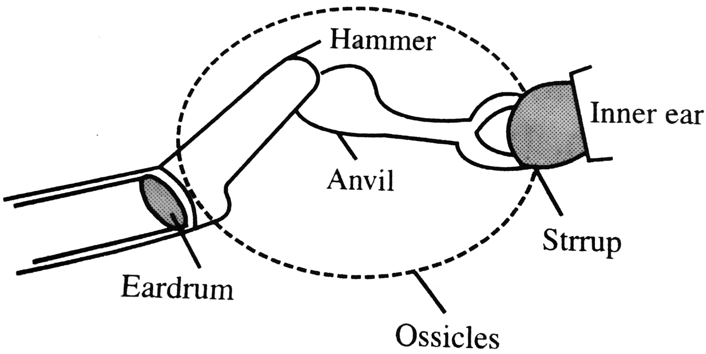

20.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^5 Pa$. Frequency of sound wave in air is $332 \frac{m}{s}$. Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^5 Pa$. Bulk modulus of fluid is $2.18 \times 10^9 Pa$.

Q. Find the pressure amplitude of given sound wave in the fluid of inner ear.

A. $0.03 Pa$

B. $0.04 Pa$

C. $0.3 Pa$

D. $0.4 Pa$

Answer: D

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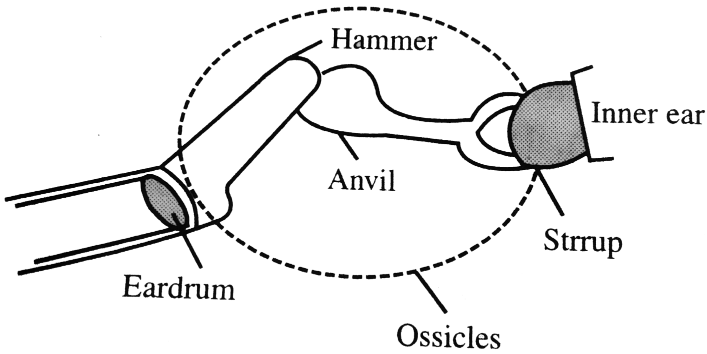

21.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The three bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardrum and ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^5 Pa$. Frequency of sound wave in air is $332 \frac{m}{s}$. Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^5 Pa$. Bulk modulus of fluid is $2.18 \times 10^9 Pa$.

Q. Find the displacement amplitude of given sound wave in the fluid of inner ear.

A. $4.4 \times 10^{-11} m$

B. $8 \times 10^{11} m$

C. $3.65 \times 10^{-11} m$

D. $8.1 \times 10^{-12} m$

Answer: C

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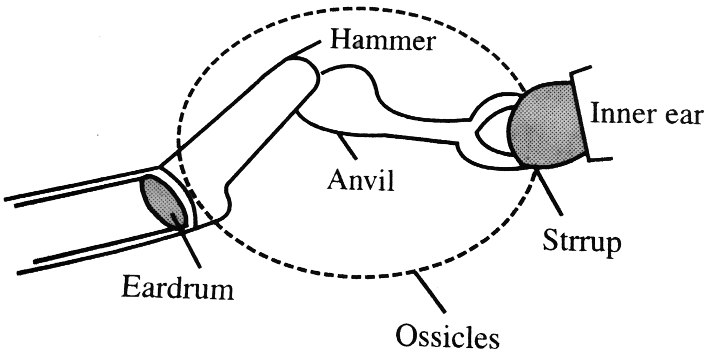

22.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. If the person is using an hearing aid, which

increase the intensity of given sound wave change as perceived by inner ear?

A. 1000

B. 100

C. 10000

D. none of these

Answer: A

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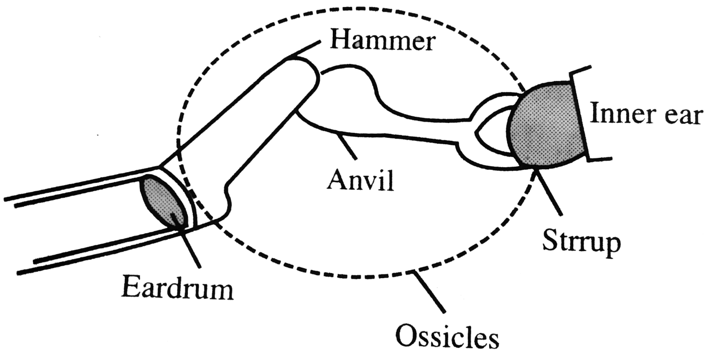

23.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. This person (without hearing aid machine) is sitting inside a busy restaurant where

average sound intensity is $3.2 \times 10^{-5} \frac{W}{m^2}$. How much energy in the form of sound is taken up by the person in his meal time of 1 h?

A. $1.2 \times 10^{-5} J$

B. $1.8 \times 10^{-4} J$

C. $2.4 \times 10^{-5} J$

D. $3.6 \times 10^{-4} J$

Answer: A

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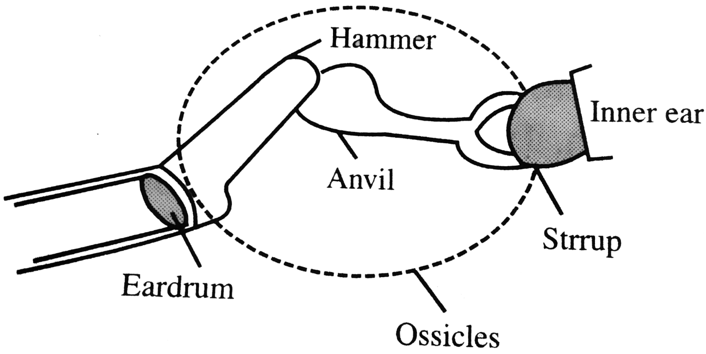

24.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50 mm^2$ and the area of stirrup is about $5 mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

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Q. With respect to information provided above, mark the correct statement.

A. The person will hear more intense sound, if area of stirrup is reduced.

B. The person will hear more intense sound, if area of stirrup is increase.

C. If mass of ossicles is not negligible, then intensity of sound heard by the person increase.

D. If amss of ossicles is not negligible, then intensity of sound heard by the person remains same.

Answer: A

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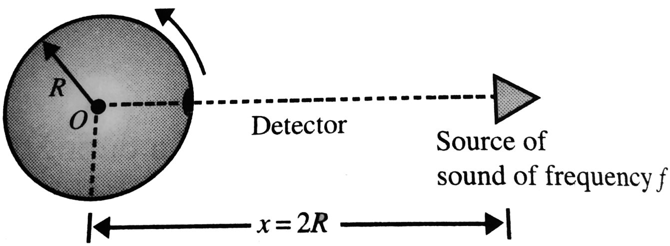

25.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise

direction at $t = 0$

(Take velocity of sound in air as v)

What is the frequency as received by detector, when it rotates by an angle $\frac{\pi}{2}$?

A. f

B. $\frac{v - \omega R}{v} \times f$

C. $\frac{v - \frac{\omega}{R}}{v} \times f$

D. $v - \frac{\omega R \times \frac{2}{\sqrt{5}}}{v} \times f$

Answer: D

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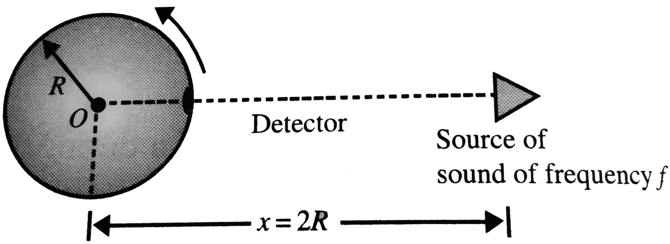

26.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Q. Find the time at which the detector will hear the maximum frequency for the first time.

A. $\dfrac{\pi}{(3\omega)}$

B. $\dfrac{5\pi}{(3\omega)}$

C. $\dfrac{4\pi}{(3\omega)}$

D. $\dfrac{\pi}{\omega}$

Answer: B

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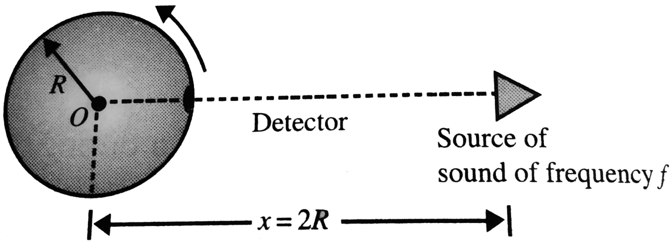

27.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Find the time interval between minimum and

maximum frequency as received by the detector.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: C

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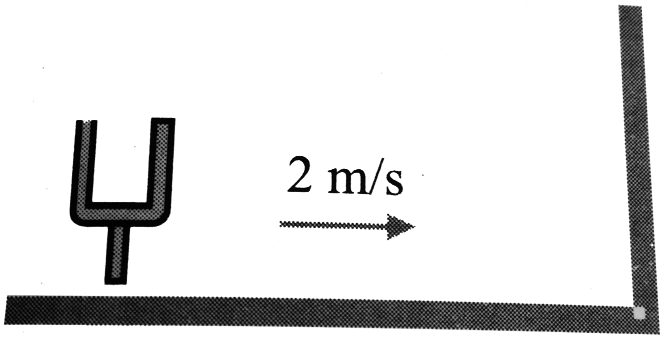

28.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. Suppose that a listener is located at rest between the tuning fork and the wall. Number

of beats heard by the listener per second will be

A. 4

B. 3

C. 0

D. 1

Answer: B

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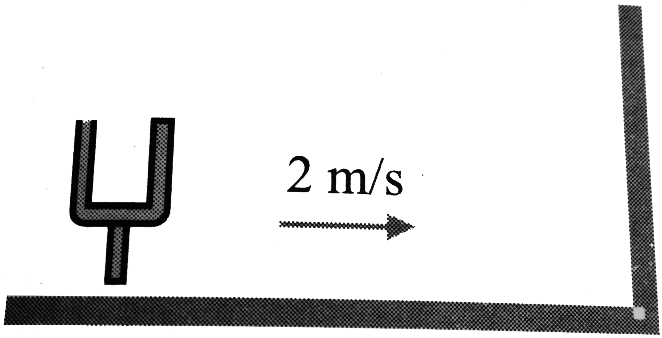

29.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener is at rest and located such that the tuning fork is moving between the

listener and the wall, number of beats heard by the listerner per second will be nearly

A. 0

B. 6

C. 8

D. 4

Answer: D

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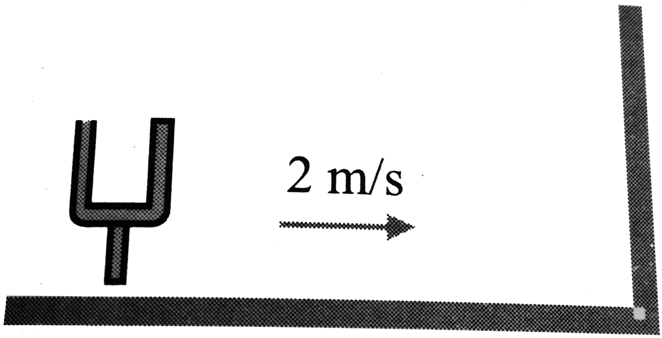

30.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener, along with the source, is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that the source remains between

the listerner and the wall, number of beats heard by the listerner per second will be

A. 4

B. 8

C. 0

D. 6

Answer: B

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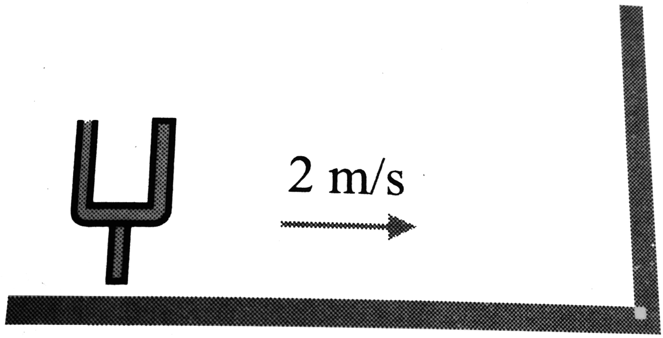

31.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listerner along with the source is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that he (listener) remains

between the source and the wall, number of beats heard by him will be

A. 2

B. 6

C. 8

D. 4

Answer: D

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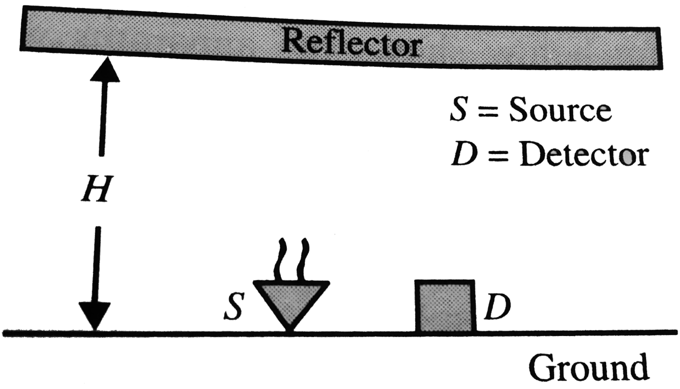
32. A source of sound with natural frequency $f_0 = 1800 Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250 m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. Find the frequency of osund received by the observer at the moment when the source gets

closest to him.



A. 2000Hz

B. 6000Hz

C. 3000Hz

D. 5000Hz

Answer: C

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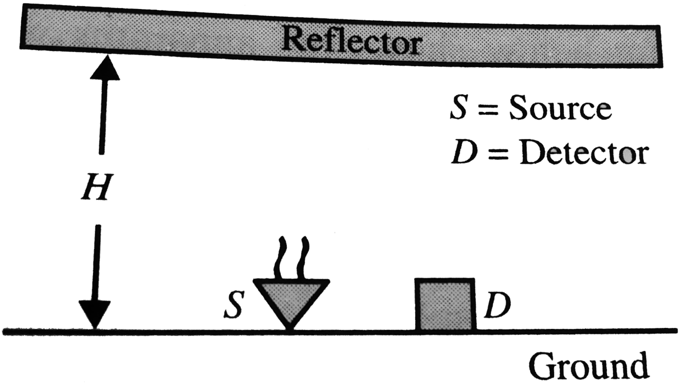
33. A source of sound with natural frequency $f_0 = 1800Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. The distance between the source and the observer at the moment when the observer

receives a frequency $f = f_0$ is



A. $640m$

B. $420m$

C. $320m$

D. $250m$

Answer: A

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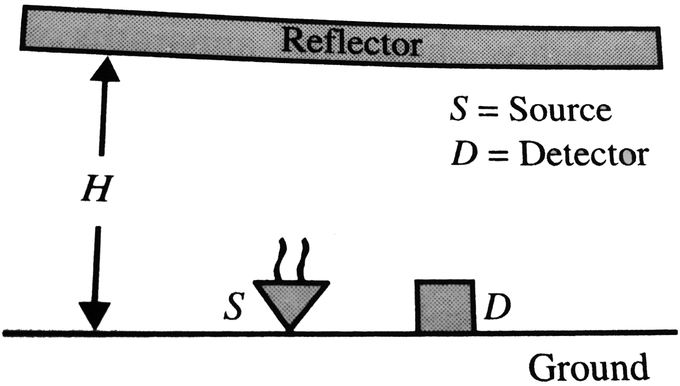

34.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0

At $t - 0$, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the following questions.

Q. Frequency of sound waves emitted by source at $t = \frac{v_0}{2g}$ is

A. f_0

B. $f_0\left[\frac{v}{v} + \frac{v_0}{2}\right]$

C. $f_0\left[\dfrac{\left(\dfrac{v-v_0}{2}\right)^2}{v}\right]$

D. $f_0\left[\dfrac{\dfrac{v-v_0}{2}}{\dfrac{v+v_0}{2}}\right]$

Answer: B

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35.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At t - 0, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> \ > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the

following questions.

Q. Wavelength of sound waves as received by detector before reflection at $t = \frac{v_0}{2g}$ is

A. $\frac{v}{f_0}$

B. $\frac{\frac{v+v_0}{2}}{f_0}$

C. $\frac{\left(\frac{v-v_0}{2}\right)^2}{vf_0}$

D. none of these

Answer: C

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36.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At $t - 0$, the vertical separation between the reflector and source is $H\left(> \frac{v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the

frequency of sound waves emitted by source.

Based on above information answer the following questions.

Q. Frequency of sound received by detector after being reflected by reflector at $t = \frac{v_0}{2g}$ is

A. $\frac{2f_0\left(v + v_0\right)}{2v - v_0}$

B. $\frac{2f_0 v}{v - v_0}$

C. $2f_0\left[\frac{v + v_0}{2v - v_0}\right] \times \left[\frac{v}{v - v_0}\right]$

D. $2f_0 \times \frac{v + v_0}{v - v_0}$

Answer: C

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37. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener in front of the train?

A. $547.6Hz$

B. $690.6Hz$

C. $590.9Hz$

D. $520.3Hz$

Answer: A

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38. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by

locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener behind the train?

A. $420Hz$

B. $460Hz$

C. $480Hz$

D. $430Hz$

Answer: B

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39. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall $\rightarrow$ source $\rightarrow$ receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The beat frequency recorded by the receiver is

A. $110Hz$

B. $210Hz$

C. $150Hz$

D. $220Hz$

Answer: A

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40. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of direct waves received by the receiver is

A. $50cm$

B. $100cm$

C. $150cm$

D. $90cm$

Answer: A

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41. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of reflected waves received by the receiver is

A. $120cm$

B. $50cm$

C. $90cm$

D. $60cm$

Answer: D

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42. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω. The velocity of sound in air is $v = 340\frac{m}{s}$.

Q. If $\omega = 10\frac{m}{s^2}$, the apparent frequency that will be recorded by the stationary receiver at $t = 10s$ will be

A. $1700Hz$

B. $1.35Hz$

C. $850 Hz$

D. $1.27 Hz$

Answer: B

Watch Video Solution

43. A source S of acoustic wave of the frequency $v_0 = 1700 Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω.

The velocity of sound in air is $v = 340\frac{m}{s}$.

If $\omega = 10\frac{m}{s^2}$ for 10s and then $\omega = 0$ for $t > 10s$, the apparent frequency recorded by the receiver at $t = 15s$

A. $1700Hz$

B. $1313Hz$

C. $850Hz$

D. $1.23Hz$

Answer: B

Watch Video Solution

44. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer situated at a great distance on a straight line perpendicular to the plane of the circle, through its centre, the apparent frequency of the source will be

A. greater that 500 Hx

B. smaller than 500 Hz

C. always remain 500 Hz

D. greater for half the circle and smaller during the other half

Answer: C

Watch Video Solution

45. A small source of sound vibrating frequency 500 Hz is rotated in a circle of

radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer who is at rest at a great distance from the centre of the circle but nearly in the same plane, the minimum $f_{\min}$ and the maximum $f_{\max}$ of the range of values of the apparent frequency heard by him will be

A. $f_{\min} = 455Hz, f_{\max} = 535Hz$

B. $f_{\min} = 484Hz, f_{\max} = 515Hz$

C. $f_{\min} = 484Hz, f_{\max} = 500Hz$

D. $f_{\min} = 500Hz, f_{\max} = 515Hz$

Answer: B

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46. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. If the observer moves towards the source

with a constant speed of $20\frac{m}{s}$, along the radial line to the centre, the fractional change in the apparent frequency over the frequency that the source will have if considered at reat at the centre will be

A. $6\ \%$

B. $3\ \%$

C. $2\ \%$

D. $9\ \%$

Answer: A

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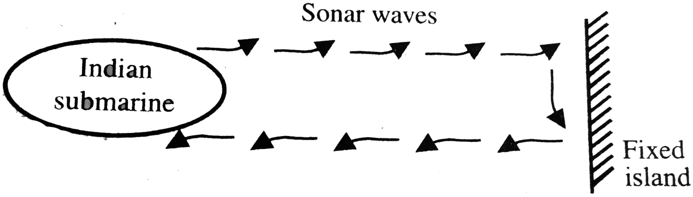
47. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be 10% greater than the sent waves.

Now an enemy ship comes in front, due to

which the frequency of reflected waves detected by submarine becomes 21% greater than the sent waves.

Q. The speed of indian submarine is



A. $10\frac{m}{s}$

B. $50\frac{m}{s}$

C. $100\frac{m}{s}$

D. $20\frac{m}{s}$

Answer: B

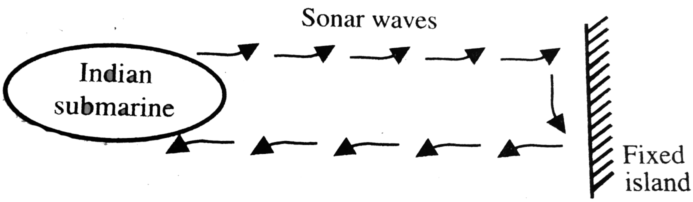
Watch Video Solution

48. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to

be 10 % greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes 21 % greater than the sent waves.

Q. The velocity of enemy ship should be



A. $50 \frac{m}{s}$ towards indian submarine

B. $50 \frac{m}{s}$ away from indian submarine

C. $100 \frac{m}{2}$ towards indian submarine

D. $100\frac{m}{s}$ away from indian submarine

Answer: A

Watch Video Solution

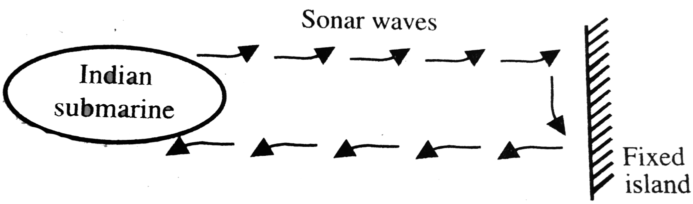
49. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to

submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes $21\,\%$ greater than the sent waves.

Q If the wavelength received by enemy ship is λ' and wavelength of reflected waves received

by submarine is λ'', then $\left(\frac{\lambda'}{\lambda''}\right)$ equals



A. 1

B. 1.1

C. 1.2

D. 2

Answer: B

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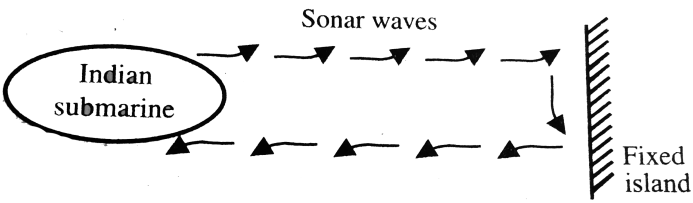
50. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050 \frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves

detected by submarine becomes 21 % greater than the sent waves.

Q. Bulk modulus of sea water should be approximately $\left(\rho =_{water} = 1000\frac{kg}{m^3}\right)$



A. $10^8 \frac{N}{m^2}$

B. $10^9 \frac{N}{m^2}$

C. $10^{10} \frac{N}{m^2}$

D. $10^{11} \frac{N}{m^2}$

Answer: B

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51. Due to point isotropic sound source, theintensity at a point is observed as 40 dB. The density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The pressure amplitude at the observation point is

A. $3\frac{N}{m^2}$

B. $3 \times 10^3\frac{N}{m^2}$

C. $3 \times 10^{-3}\frac{N}{m^2}$

D. $6 \times 10^{-2}\frac{N}{m^2}$

Answer: C

Watch Video Solution

52. Due to point isotropic sound source, the intensity at a point is observed as 40 dB. The

density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The ratio of displacement amplitude of wave at observation point to wavelength of sound waves is

A. 3.22×10^{-6}

B. 3.22×10^{-12}

C. 3.22×10^{-9}

D. 1.07×10^{-10}

Answer: C

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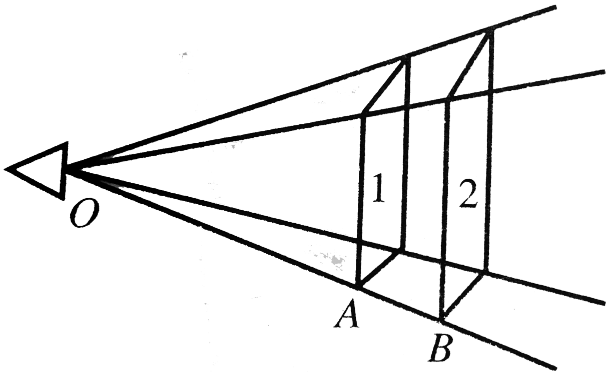

53.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2

having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. find the intensity at both the surfaces.

A. $I_1 = 12 \times 10^{-6} \frac{W}{m^2}, I_2 = 12 \times 10^{-6} \frac{W}{m^2}$

B. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 12 \times 10^{-9} \frac{W}{m^2}$

C. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

D. $I_1 = 12 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

Answer: C

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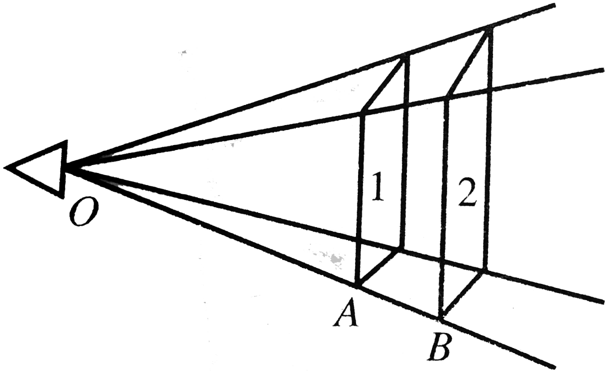

54.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. If two persons (having almost same physique) A and B are standing at the location

of surfaces 1 and 2, respectively, then who will hear a quiter sound?

A. Both will hear same sound.

B. A will bear a quiter sound

C. B will hear a quiter sound

D. information is not sufficient

Answer: C

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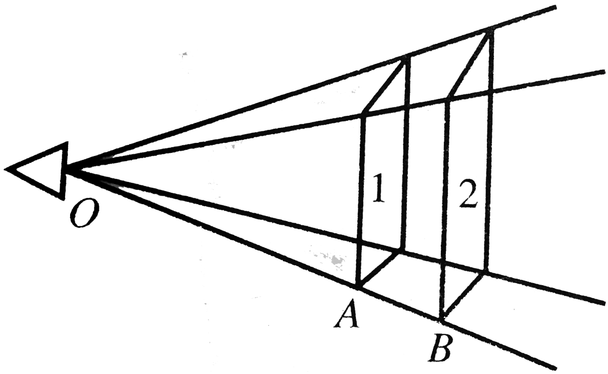

55.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. Let the areas of the eardrums of persons A and B be $A_A = 2mm^2$ and $A_B = 4mm^2$,

respectively. Then who will hear a quiter sound?

A. A will hear a quiter sound.

B. B will hear quiter sound

C. Both will hear the same sound.

D. Cannot say anything.

Answer: C

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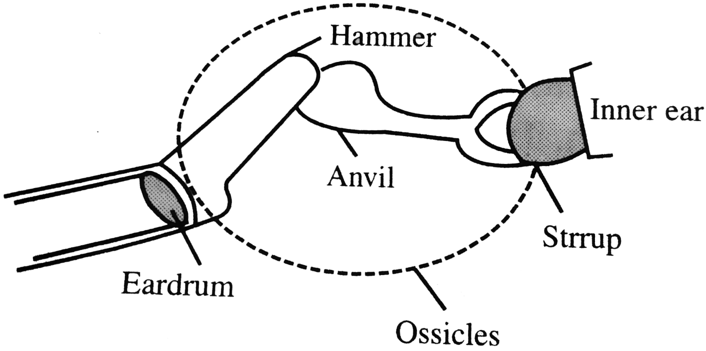

56.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50 mm^2$ and the area of stirrup is about $5 mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^5 Pa.$ Frequency of sound wave in air is $332 \frac{m}{s}$. Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^5 Pa.$ Bulk modulus of fluid is $2.18 \times 10^9 Pa.$

Q. Find the pressure amplitude of given sound wave in the fluid of inner ear.

A. $0.03 Pa$

B. $0.04 Pa$

C. $0.3 Pa$

D. $0.4 Pa$

Answer: D

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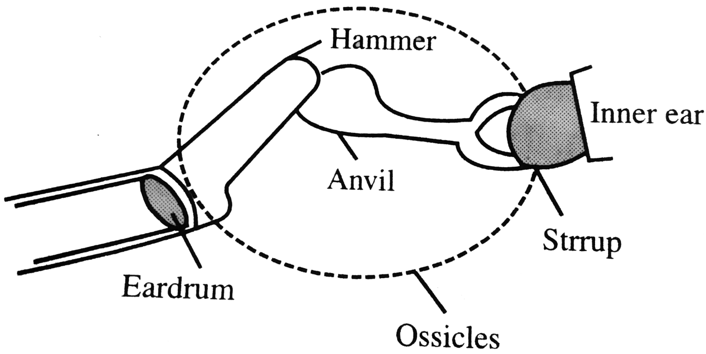

57.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. Find the displacement amplitude of given sound wave in the fluid of inner ear.

A. $4.4 \times 10^{-11} m$

B. $8 \times 10^{11} m$

C. $3.65 \times 10^{-11} m$

D. $8.1 \times 10^{-12} m$

Answer: C

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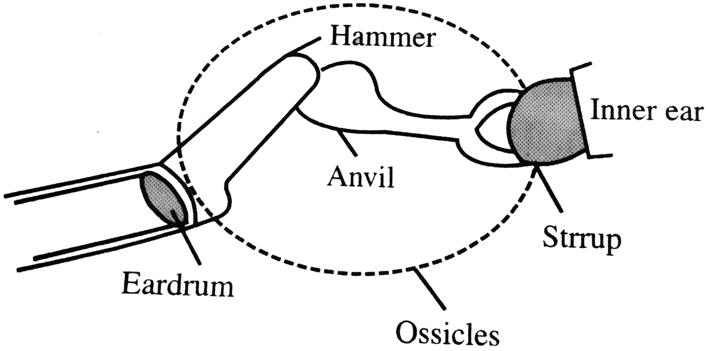

58.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. If the person is using an hearing aid, which

increase the intensity of given sound wave change as perceived by inner ear?

A. 1000

B. 100

C. 10000

D. none of these

Answer: A

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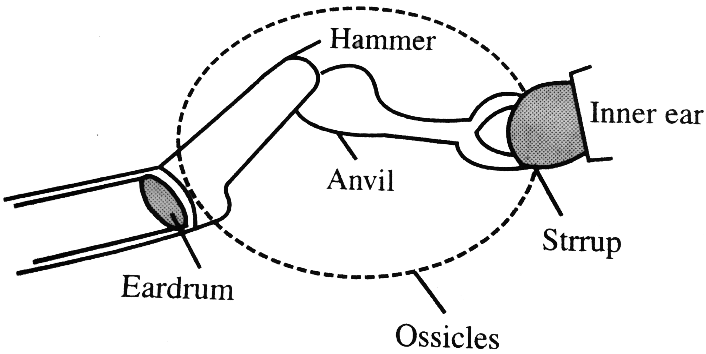

59.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. This person (without hearing aid machine) is sitting inside a busy restaurant where

average sound intensity is $3.2 \times 10^{-5} \frac{W}{m^2}$. How much energy in the form of sound is taken up by the person in his meal time of 1 h?

A. $1.2 \times 10^{-5} J$

B. $1.8 \times 10^{-4} J$

C. $2.4 \times 10^{-5} J$

D. $3.6 \times 10^{-4} J$

Answer: A

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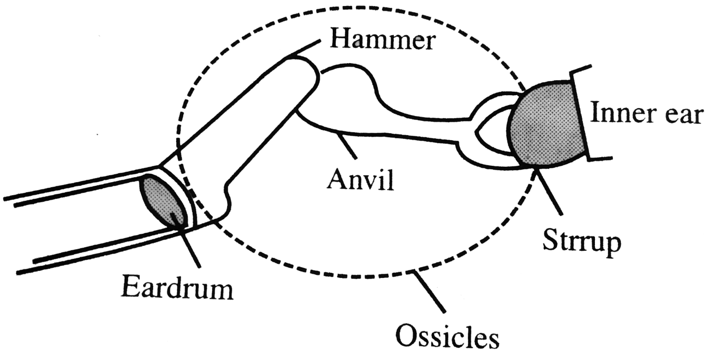

60.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. With respect to information provided above, mark the correct statement.

A. The person will hear more intense sound, if area of stirrup is reduced.

B. The person will hear more intense sound, if area of stirrup is increase.

C. If mass of ossicles is not negligible, then intensity of sound heard by the person increase.

D. If amss of ossicles is not negligible, then intensity of sound heard by the person remains same.

Answer: A

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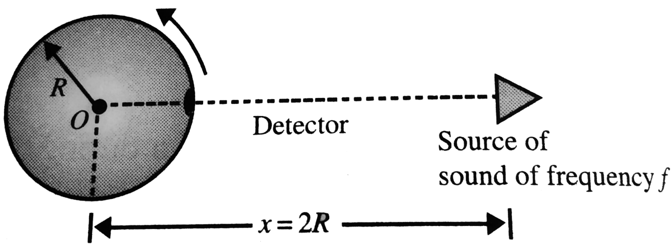

61.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise

direction at $t = 0$

(Take velocity of sound in air as v)

What is the frequency as received by detector, when it rotates by an angle $\frac{\pi}{2}$?

A. f

B. $\frac{v - \omega R}{v} \times f$

C. $\frac{v - \frac{\omega}{R}}{v} \times f$

D. $v - \frac{\omega R \times \frac{2}{\sqrt{5}}}{v} \times f$

Answer: D

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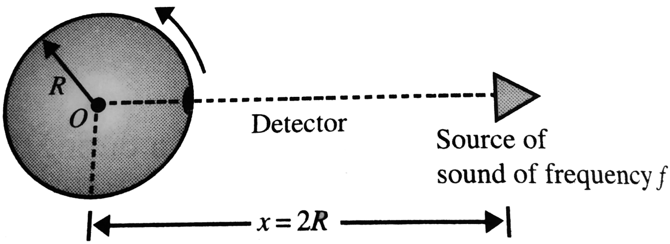

62.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Q. Find the time at which the detector will hear the maximum frequency for the first time.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: B

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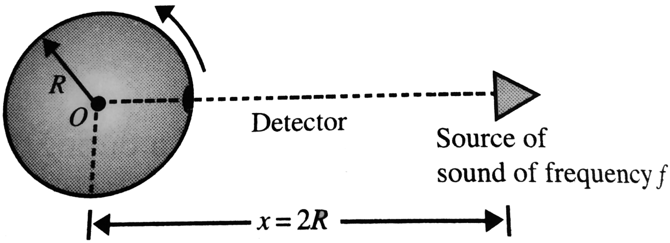

63.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Find the time interval between minimum and

maximum frequency as received by the detector.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: C

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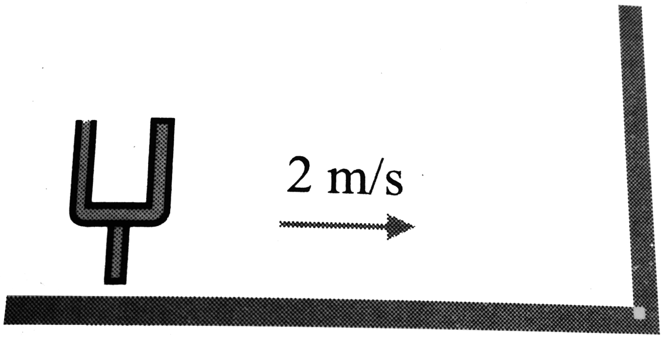

64.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. Suppose that a listener is located at rest between the tuning fork and the wall. Number

of beats heard by the listener per second will be

A. 4

B. 3

C. 0

D. 1

Answer: B

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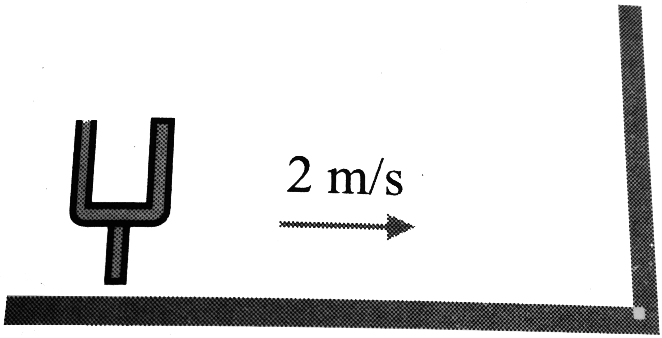

65.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener is at rest and located such that the tuning fork is moving between the

listener and the wall, number of beats heard by the listerner per second will be nearly

A. 0

B. 6

C. 8

D. 4

Answer: D

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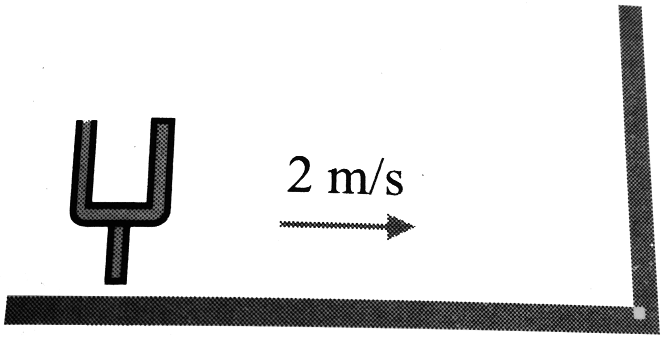

66.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener, along with the source, is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that the source remains between

the listerner and the wall, number of beats heard by the listerner per second will be

A. 4

B. 8

C. 0

D. 6

Answer: B

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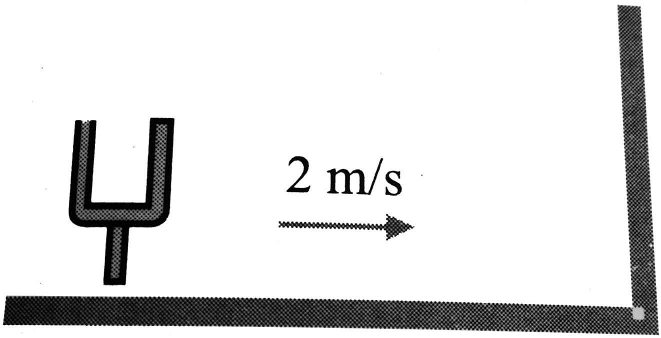

67.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listerner along with the source is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that he (listener) remains

between the source and the wall, number of beats heard by him will be

A. 2

B. 6

C. 8

D. 4

Answer: D

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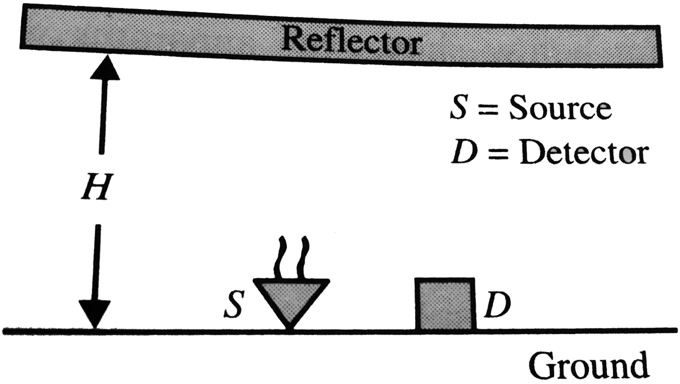
68. A source of sound with natural frequency $f_0 = 1800 Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250 m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. Find the frequency of osund received by the observer at the moment when the source gets

closest to him.



A. 2000Hz

B. 6000Hz

C. 3000Hz

D. 5000Hz

Answer: C

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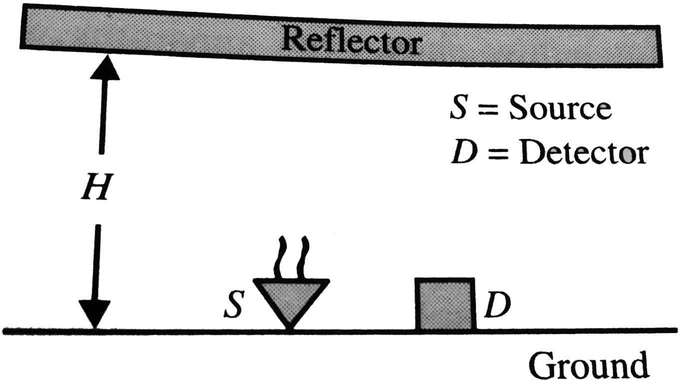
69. A source of sound with natural frequency $f_0 = 1800Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. The distance between the source and the observer at the moment when the observer

receives a frequency $f = f_0$ is



A. $640m$

B. $420m$

C. $320m$

D. $250m$

Answer: A

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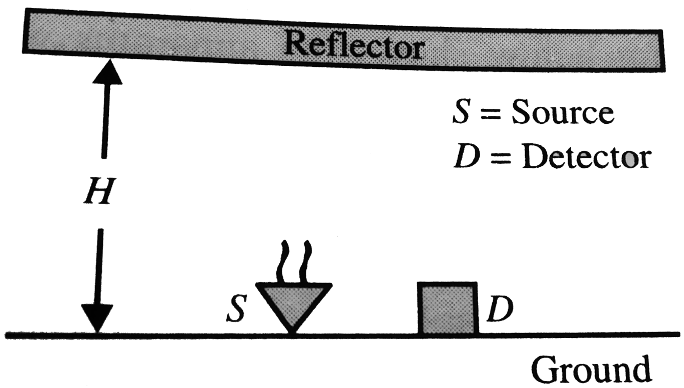

70.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0

At t - 0, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the following questions.

Q. Frequency of sound waves emitted by source at $t = \frac{v_0}{2g}$ is

A. f_0

B. $f_0\left[\frac{v}{v} + \frac{v_0}{2}\right]$

C. $f_0\left[\frac{\left(\frac{v-v_0}{2}\right)^2}{v}\right]$

D. $f_0\left[\frac{\frac{v-v_0}{2}}{\frac{v+v_0}{2}}\right]$

Answer: B

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71.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At t - 0, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the

following questions.

Q. Wavelength of sound waves as received by detector before reflection at $t = \frac{v_0}{2g}$ is

A. $\frac{v}{f_0}$

B. $\frac{\frac{v+v_0}{2}}{f_0}$

C. $\frac{\left(\frac{v-v_0}{2}\right)^2}{vf_0}$

D. none of these

Answer: C

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72.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At $t - 0$, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the

frequency of sound waves emitted by source.

Based on above information answer the following questions.

Q. Frequency of sound received by detector after being reflected by reflector at $t = \frac{v_0}{2g}$ is

A. $\frac{2f_0\left(v + v_0\right)}{2v - v_0}$

B. $\frac{2f_0 v}{v - v_0}$

C. $2f_0\left[\frac{v + v_0}{2v - v_0}\right] \times \left[\frac{v}{v - v_0}\right]$

D. $2f_0 \times \frac{v + v_0}{v - v_0}$

Answer: C

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73. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener in front of the train?

A. $547.6Hz$

B. $690.6Hz$

C. $590.9Hz$

D. $520.3Hz$

Answer: A

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74. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by

locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener behind the train?

A. $420Hz$

B. $460Hz$

C. $480Hz$

D. $430Hz$

Answer: B

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75. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall $\rightarrow$ source $\rightarrow$ receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The beat frequency recorded by the receiver is

A. $110Hz$

B. $210Hz$

C. $150Hz$

D. $220Hz$

Answer: A

Watch Video Solution

76. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of direct waves received by the receiver is

A. $50cm$

B. $100cm$

C. $150cm$

D. $90cm$

Answer: A

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77. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of reflected waves received by the receiver is

A. $120cm$

B. $50cm$

C. $90cm$

D. $60cm$

Answer: D

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78. A source S of acoustic wave of the frequency $\nu_0 = 1700 Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω. The velocity of sound in air is $v = 340 \frac{m}{s}$.

Q. If $\omega = 10 \frac{m}{s^2}$, the apparent frequency that will be recorded by the stationary receiver at $t = 10 s$ will be

A. $1700 Hz$

B. $1.35 Hz$

C. $850Hz$

D. $1.27Hz$

Answer: B

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79. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω.

The velocity of sound in air is $v = 340\frac{m}{s}$.

If $\omega = 10\frac{m}{s^2}$ for 10s and then $\omega = 0$ for $t > 10s$, the apparent frequency recorded by the receiver at $t = 15s$

A. $1700Hz$

B. $1313Hz$

C. $850Hz$

D. $1.23Hz$

Answer: B

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80. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer situated at a great distance on a straight line perpendicular to the plane of the circle, through its centre, the apparent frequency of the source will be

A. greater that 500 Hx

B. smaller than 500 Hz

C. always remain 500 Hz

D. greater for half the circle and smaller during the other half

Answer: C

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81. A small source of sound vibrating frequency 500 Hz is rotated in a circle of

radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer who is at rest at a great distance from the centre of the circle but nearly in the same plane, the minimum $f_{\min}$ and the maximum $f_{\max}$ of the range of values of the apparent frequency heard by him will be

A. $f_{\min} = 455Hz, f_{\max} = 535Hz$

B. $f_{\min} = 484Hz, f_{\max} = 515Hz$

C. $f_{\min} = 484Hz, f_{\max} = 500Hz$

D. $f_{\min} = 500Hz, f_{\max} = 515Hz$

Answer: B

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82. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. If the observer moves towards the source

with a constant speed of $20\frac{m}{s}$, along the radial line to the centre, the fractional change in the apparent frequency over the frequency that the source will have if considered at reat at the centre will be

A. 6%

B. 3%

C. 2%

D. 9%

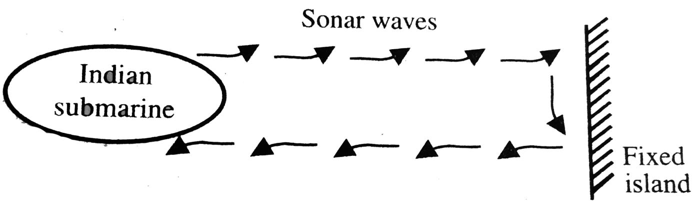
Answer: A

83. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be 10% greater than the sent waves.

Now an enemy ship comes in front, due to

which the frequency of reflected waves detected by submarine becomes $21\ \%$ greater than the sent waves.

Q. The speed of indian submarine is



A. $10\frac{m}{s}$

B. $50\frac{m}{s}$

C. $100\frac{m}{s}$

D. $20\frac{m}{s}$

Answer: B

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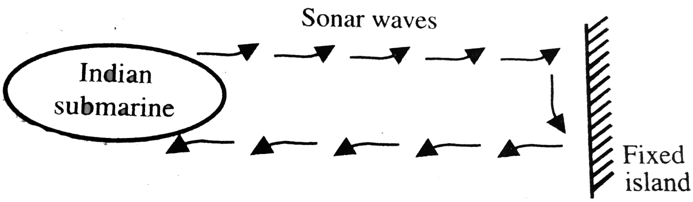
84. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to

be 10 % greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes 21 % greater than the sent waves.

Q. The velocity of enemy ship should be



A. $50\frac{m}{s}$ towards indian submarine

B. $50\frac{m}{s}$ away from indian submarine

C. $100\frac{m}{2}$ towards indian submarine

D. $100\frac{m}{s}$ away from indian submarine

Answer: A

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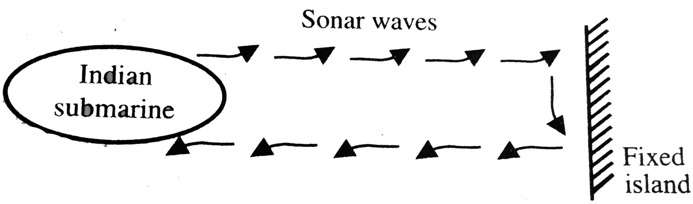
85. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to

submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes $21\,\%$ greater than the sent waves.

Q If the wavelength received by enemy ship is λ' and wavelength of reflected waves received

by submarine is λ'', then $\left(\frac{\lambda'}{\lambda''}\right)$ equals



A. 1

B. 1.1

C. 1.2

D. 2

Answer: B

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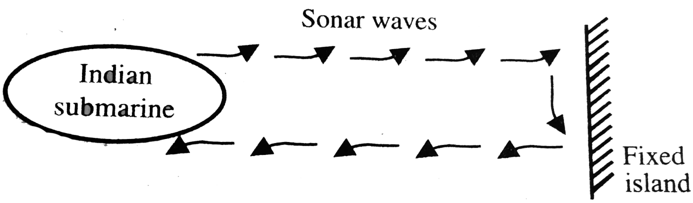
86. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be $10\ \%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves

detected by submarine becomes 21 % greater than the sent waves.

Q. Bulk modulus of sea water should be approximately $\left(\rho =_{water} = 1000\frac{kg}{m^3}\right)$



A. $10^8\frac{N}{m^2}$

B. $10^9\frac{N}{m^2}$

C. $10^{10}\frac{N}{m^2}$

D. $10^{11}\frac{N}{m^2}$

Answer: B

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87. Due to point isotropic sound source, theintensity at a point is observed as 40 dB. The density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The pressure amplitude at the observation point is

A. $3\frac{N}{m^2}$

B. $3 \times 10^3 \frac{N}{m^2}$

C. $3 \times 10^{-3} \frac{N}{m^2}$

D. $6 \times 10^{-2} \frac{N}{m^2}$

Answer: C

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88. Due to point isotropic sound source, the intensity at a point is observed as 40 dB. The

density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The ratio of displacement amplitude of wave at observation point to wavelength of sound waves is

A. 3.22×10^{-6}

B. 3.22×10^{-12}

C. 3.22×10^{-9}

D. 1.07×10^{-10}

Answer: C

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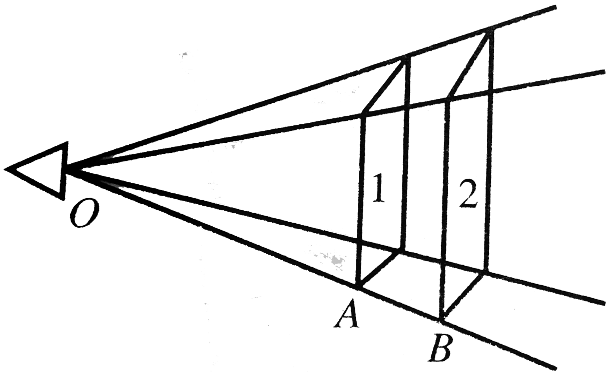

89.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2

having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. find the intensity at both the surfaces.

A. $I_1 = 12 \times 10^{-6} \frac{W}{m^2}, I_2 = 12 \times 10^{-6} \frac{W}{m^2}$

B. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 12 \times 10^{-9} \frac{W}{m^2}$

C. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

D. $I_1 = 12 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

Answer: C

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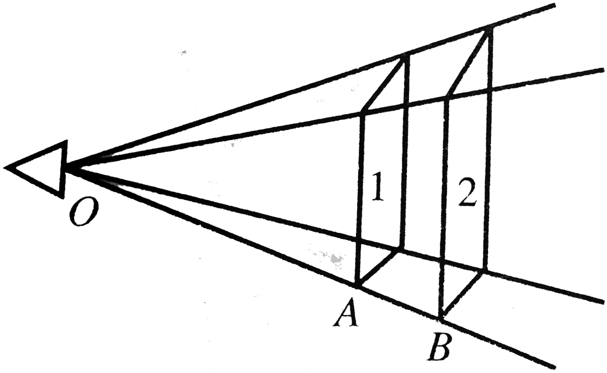

90.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. If two persons (having almost same physique) A and B are standing at the location

of surfaces 1 and 2, respectively, then who will hear a quiter sound?

A. Both will hear same sound.

B. A will bear a quiter sound

C. B will hear a quiter sound

D. information is not sufficient

Answer: C

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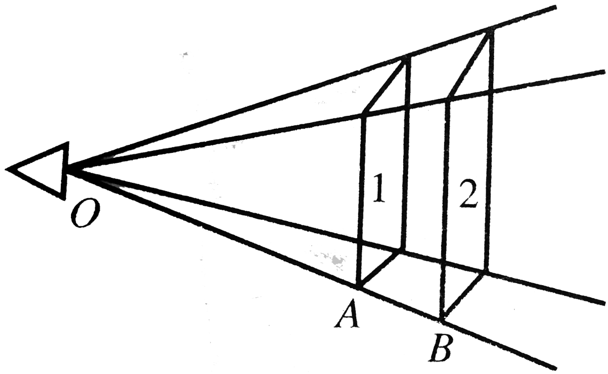

91.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. Let the areas of the eardrums of persons A and B be $A_A = 2mm^2$ and $A_B = 4mm^2$,

respectively. Then who will hear a quiter sound?

A. A will hear a quiter sound.

B. B will hear quiter sound

C. Both will hear the same sound.

D. Cannot say anything.

Answer: C

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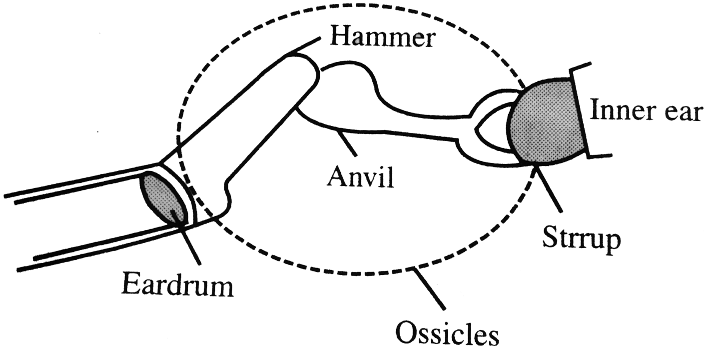

92.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^5 Pa$. Frequency of sound wave in air is $332 \frac{m}{s}$. Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^5 Pa$. Bulk modulus of fluid is $2.18 \times 10^9 Pa$.

Q. Find the pressure amplitude of given sound wave in the fluid of inner ear.

A. $0.03 Pa$

B. $0.04 Pa$

C. $0.3 Pa$

D. $0.4 Pa$

Answer: D

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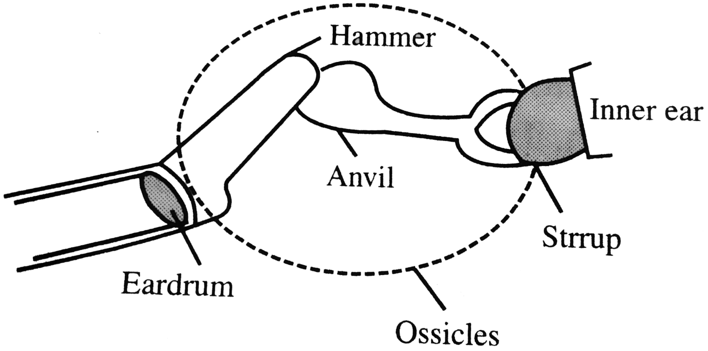

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Q. Find the displacement amplitude of given sound wave in the fluid of inner ear.

A. $4.4 \times 10^{-11} m$

B. $8 \times 10^{11} m$

C. $3.65 \times 10^{-11} m$

D. $8.1 \times 10^{-12} m$

Answer: C

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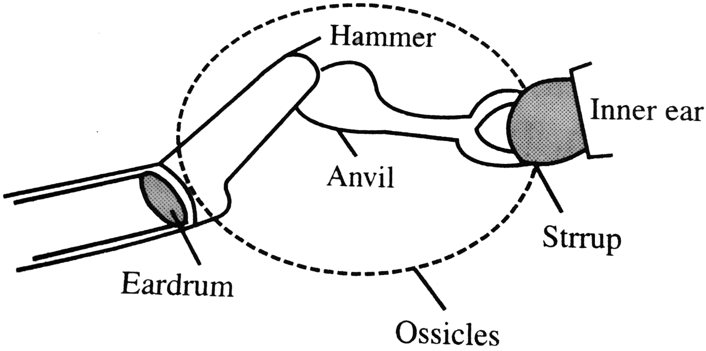

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Q. If the person is using an hearing aid, which

increase the intensity of given sound wave change as perceived by inner ear?

A. 1000

B. 100

C. 10000

D. none of these

Answer: A

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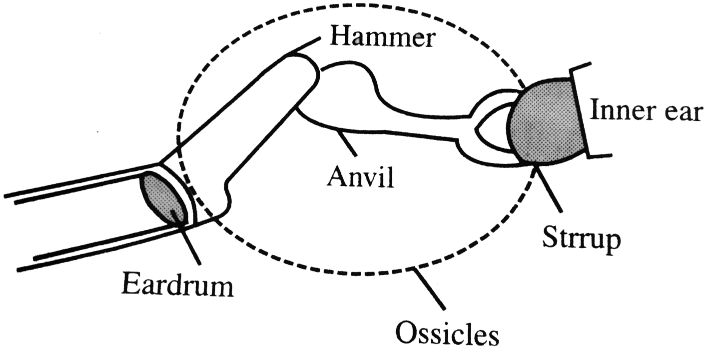

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Q. This person (without hearing aid machine) is sitting inside a busy restaurant where

average sound intensity is $3.2 \times 10^{-5} \frac{W}{m^2}$. How much energy in the form of sound is taken up by the person in his meal time of 1 h?

A. $1.2 \times 10^{-5} J$

B. $1.8 \times 10^{-4} J$

C. $2.4 \times 10^{-5} J$

D. $3.6 \times 10^{-4} J$

Answer: A

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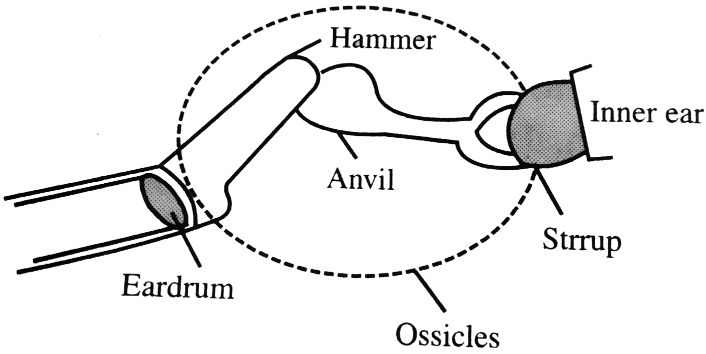

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Q. With respect to information provided above, mark the correct statement.

A. The person will hear more intense sound, if area of stirrup is reduced.

B. The person will hear more intense sound, if area of stirrup is increase.

C. If mass of ossicles is not negligible, then intensity of sound heard by the person increase.

D. If amss of ossicles is not negligible, then intensity of sound heard by the person remains same.

Answer: A

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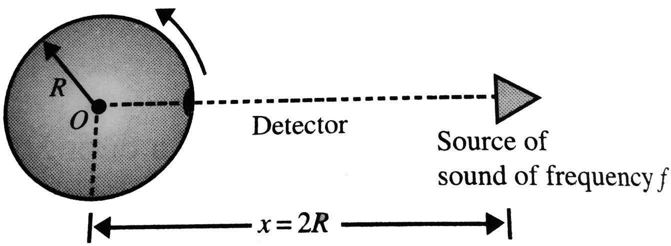

97.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise

direction at $t = 0$

(Take velocity of sound in air as v)

What is the frequency as received by detector,

when it rotates by an angle $\frac{\pi}{2}$?

A. f

B. $\frac{v - \omega R}{v} \times f$

C. $\frac{v - \frac{\omega}{R}}{v} \times f$

D. $v - \frac{\omega R \times \frac{2}{\sqrt{5}}}{v} \times f$

Answer: D

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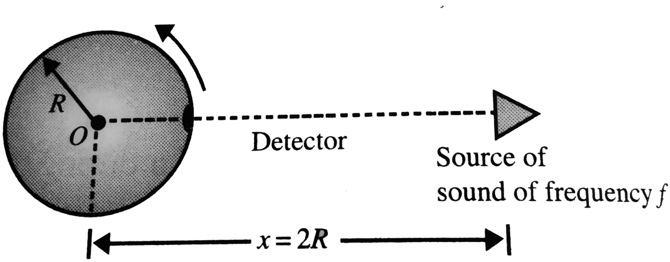

98.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Q. Find the time at which the detector will hear the maximum frequency for the first time.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: B

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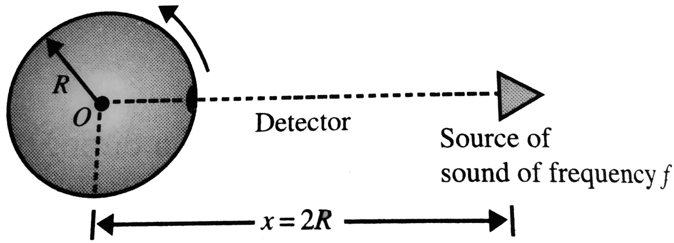

99.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Find the time interval between minimum and

maximum frequency as received by the detector.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: C

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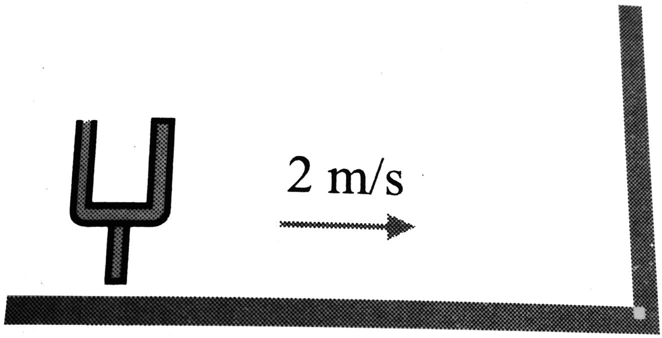

100.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. Suppose that a listener is located at rest between the tuning fork and the wall. Number

of beats heard by the listener per second will be

A. 4

B. 3

C. 0

D. 1

Answer: B

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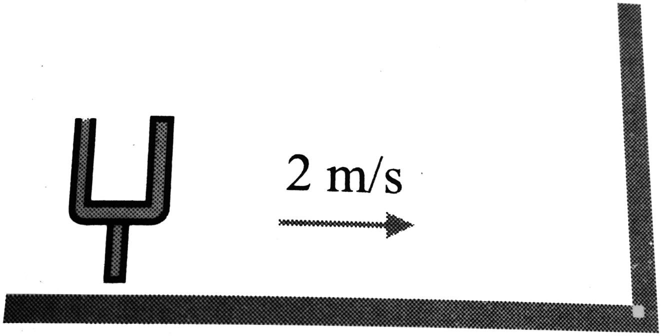

101.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener is at rest and located such that the tuning fork is moving between the

listener and the wall, number of beats heard by the listerner per second will be nearly

A. 0

B. 6

C. 8

D. 4

Answer: D

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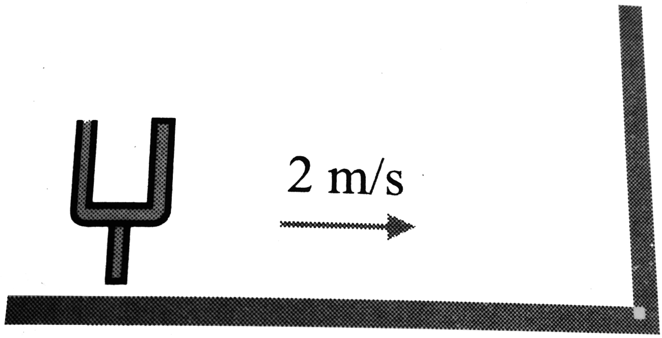

102.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener, along with the source, is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that the source remains between

the listerner and the wall, number of beats heard by the listerner per second will be

A. 4

B. 8

C. 0

D. 6

Answer: B

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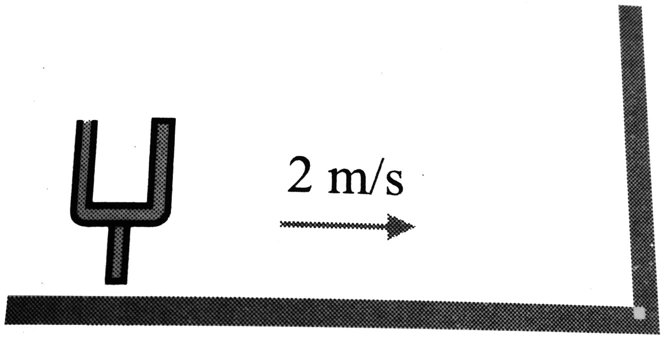

103.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listerner along with the source is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that he (listener) remains

between the source and the wall, number of beats heard by him will be

A. 2

B. 6

C. 8

D. 4

Answer: D

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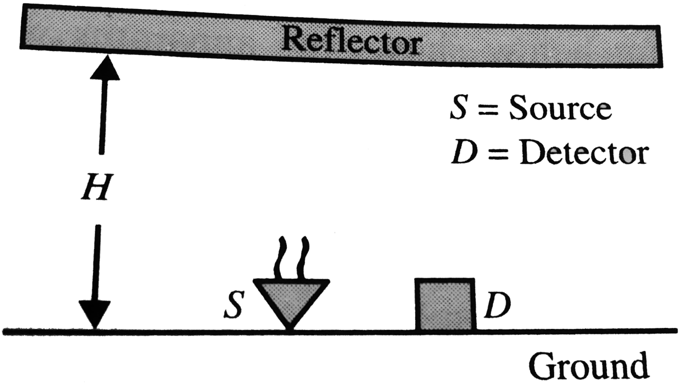
104. A source of sound with natural frequency $f_0 = 1800 Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250 m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. Find the frequency of osund received by the observer at the moment when the source gets

closest to him.



A. 2000Hz

B. 6000Hz

C. 3000Hz

D. 5000Hz

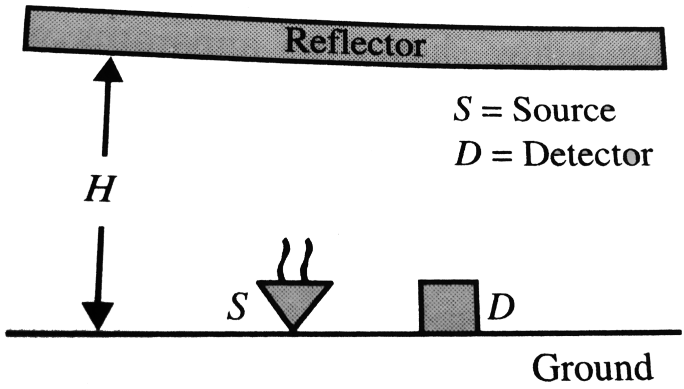
Answer: C

Watch Video Solution

105. A source of sound with natural frequency $f_0 = 1800Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. The distance between the source and the observer at the moment when the observer

receives a frequency $f = f_0$ is



A. $640m$

B. $420m$

C. $320m$

D. $250m$

Answer: A

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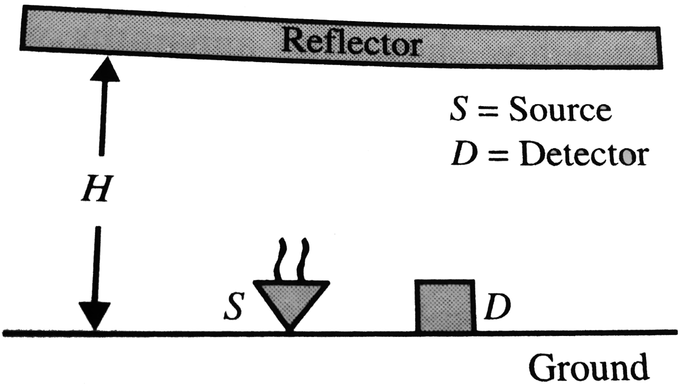

106.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0

At $t - 0$, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the following questions.

Q. Frequency of sound waves emitted by source at $t = \frac{v_0}{2g}$ is

A. f_0

B. $f_0\left[\frac{v}{v} + \frac{v_0}{2}\right]$

C. $f_0\left[\dfrac{\left(\dfrac{v-v_0}{2}\right)^2}{v}\right]$

D. $f_0\left[\dfrac{\dfrac{v-v_0}{2}}{\dfrac{v+v_0}{2}}\right]$

Answer: B

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107.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At t - 0, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the

following questions.

Q. Wavelength of sound waves as received by detector before reflection at $t = \dfrac{v_0}{2g}$ is

A. $\dfrac{v}{f_0}$

B. $\dfrac{\frac{v+v_0}{2}}{f_0}$

C. $\dfrac{\left(\frac{v-v_0}{2}\right)^2}{vf_0}$

D. none of these

Answer: C

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108.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At $t - 0$, the vertical separation between the reflector and source is $H\left(\dfrac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> \; > v_0\right)$, Take f_0 as the

frequency of sound waves emitted by source.

Based on above information answer the following questions.

Q. Frequency of sound received by detector after being reflected by reflector at $t = \dfrac{v_0}{2g}$ is

A. $\dfrac{2f_0\left(v + v_0\right)}{2v - v_0}$

B. $\dfrac{2f_0 v}{v - v_0}$

C. $2f_0\left[\dfrac{v + v_0}{2v - v_0}\right] \times \left[\dfrac{v}{v - v_0}\right]$

D. $2f_0 \times \dfrac{v + v_0}{v - v_0}$

Answer: C

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109. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by locomotive whistle is 500 Hz. Speed of sound is $345\frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener in front of the train?

A. $547.6 Hz$

B. $690.6 Hz$

C. $590.9 Hz$

D. $520.3 Hz$

Answer: A

Watch Video Solution

110. A railroad train is travelling at $30\frac{m}{s}$ in still air. The frequency of the note emitted by

locomotive whistle is 500 Hz. Speed of sound is $345 \frac{m}{s}$.

Q. What is the frequency of the sound waves heard by a stationary listener behind the train?

A. $420 Hz$

B. $460 Hz$

C. $480 Hz$

D. $430 Hz$

Answer: B

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111. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The beat frequency recorded by the receiver is

A. $110Hz$

B. $210Hz$

C. $150Hz$

D. $220Hz$

Answer: A

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112. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall → source → receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of direct waves received by the receiver is

A. $50cm$

B. $100cm$

C. $150cm$

D. $90cm$

Answer: A

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113. A source of sonic oscillation with frequency $n_0 = 600Hz$ moves away and at right angles to a wall with velocity $u = 30\frac{m}{s}$. A stationary reciever is located on the line of source in succession wall $\rightarrow$ source $\rightarrow$ receiver. If velocity of osund propagation is $v = 330\frac{m}{s}$, then

Q. The wavelength of reflected waves received by the receiver is

A. $120cm$

B. $50cm$

C. $90cm$

D. $60cm$

Answer: D

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114. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω. The velocity of sound in air is $v = 340\frac{m}{s}$.

Q. If $\omega = 10\frac{m}{s^2}$, the apparent frequency that will be recorded by the stationary receiver at $t = 10s$ will be

A. $1700Hz$

B. $1.35Hz$

C. $850Hz$

D. $1.27Hz$

Answer: B

Watch Video Solution

115. A source S of acoustic wave of the frequency $v_0 = 1700Hz$ and a receiver R are located at the same point. At the instant $t = 0$, the source start from rest to move away from the receiver with a constant acceleration ω.

The velocity of sound in air is $v = 340\frac{m}{s}$.

If $\omega = 10\frac{m}{s^2}$ for 10s and then $\omega = 0$ for $t > 10s$, the apparent frequency recorded by the receiver at $t = 15s$

A. $1700Hz$

B. $1313Hz$

C. $850Hz$

D. $1.23Hz$

Answer: B

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116. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer situated at a great distance on a straight line perpendicular to the plane of the circle, through its centre, the apparent frequency of the source will be

A. greater that 500 Hx

B. smaller than 500 Hz

C. always remain 500 Hz

D. greater for half the circle and smaller during the other half

Answer: C

Watch Video Solution

117. A small source of sound vibrating frequency 500 Hz is rotated in a circle of

radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. For an observer who is at rest at a great distance from the centre of the circle but nearly in the same plane, the minimum $f_{\min}$ and the maximum $f_{\max}$ of the range of values of the apparent frequency heard by him will be

A. $f_{\min} = 455Hz, f_{\max} = 535Hz$

B. $f_{\min} = 484Hz, f_{\max} = 515Hz$

C. $f_{\min} = 484Hz, f_{\max} = 500Hz$

D. $f_{\min} = 500Hz, f_{\max} = 515Hz$

Answer: B

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118. A small source of sound vibrating frequency 500 Hz is rotated in a circle of radius $\frac{100}{\pi}$ cm at a constant angular speed of 5.0 revolutions per second. The speed of sound in air is $330\frac{m}{s}$.

Q. If the observer moves towards the source

with a constant speed of $20\frac{m}{s}$, along the radial line to the centre, the fractional change in the apparent frequency over the frequency that the source will have if considered at reat at the centre will be

A. 6%

B. 3%

C. 2%

D. 9%

Answer: A

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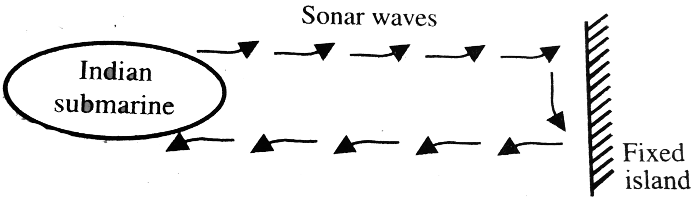
119. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be 10% greater than the sent waves.

Now an enemy ship comes in front, due to

which the frequency of reflected waves detected by submarine becomes $21\,\%$ greater than the sent waves.

Q. The speed of indian submarine is



A. $10\frac{m}{s}$

B. $50\frac{m}{s}$

C. $100\frac{m}{s}$

D. $20\frac{m}{s}$

Answer: B

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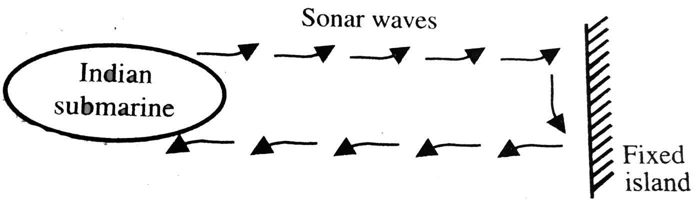
120. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to

be 10 % greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes 21 % greater than the sent waves.

Q. The velocity of enemy ship should be



A. $50\frac{m}{s}$ towards indian submarine

B. $50\frac{m}{s}$ away from indian submarine

C. $100\frac{m}{2}$ towards indian submarine

D. $100\frac{m}{s}$ away from indian submarine

Answer: A

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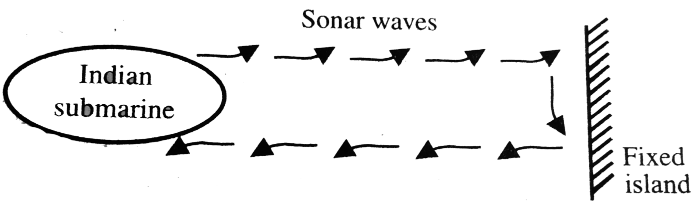
121. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to

submarine. The frequency of reflected waves are detected by the submarine and found to be $10\,\%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves detected by submarine becomes $21\,\%$ greater than the sent waves.

Q If the wavelength received by enemy ship is λ' and wavelength of reflected waves received

by submarine is λ'', then $\left(\frac{\lambda'}{\lambda''}\right)$ equals



A. 1

B. 1.1

C. 1.2

D. 2

Answer: B

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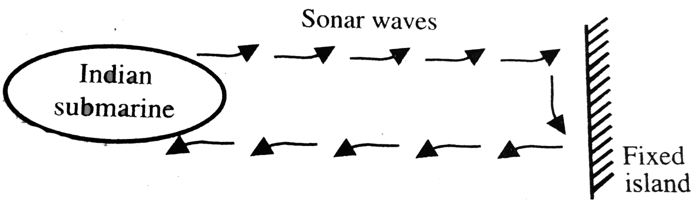
122. An indian submarine is moving in the Arabian sea with constant velocity. To detect enemy it sends out sonar waves which travel with velocity $1050\frac{m}{s}$ in water. Initially the waves are getting reflected from a fixed island and the reflected waves are coming back to submarine. The frequency of reflected waves are detected by the submarine and found to be $10\ \%$ greater than the sent waves.

Now an enemy ship comes in front, due to which the frequency of reflected waves

detected by submarine becomes 21 % greater than the sent waves.

Q. Bulk modulus of sea water should be approximately $\left(\rho =_{water} = 1000\frac{kg}{m^3}\right)$



A. $10^8\frac{N}{m^2}$

B. $10^9\frac{N}{m^2}$

C. $10^{10}\frac{N}{m^2}$

D. $10^{11}\frac{N}{m^2}$

Answer: B

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123. Due to point isotropic sound source, theintensity at a point is observed as 40 dB. The density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The pressure amplitude at the observation point is

A. $3\dfrac{N}{m^2}$

B. $3 \times 10^3 \dfrac{N}{m^2}$

C. $3 \times 10^{-3} \dfrac{N}{m^2}$

D. $6 \times 10^{-2} \dfrac{N}{m^2}$

Answer: C

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124. Due to point isotropic sound source, the intensity at a point is observed as 40 dB. The

density of air is $\rho = \left(\frac{15}{11}\right)\frac{kg}{m^3}$ and velocity of sound in air is $330\frac{m}{s}$. Based on this information answer the following questions.

Q. The ratio of displacement amplitude of wave at observation point to wavelength of sound waves is

A. 3.22×10^{-6}

B. 3.22×10^{-12}

C. 3.22×10^{-9}

D. 1.07×10^{-10}

Answer: C

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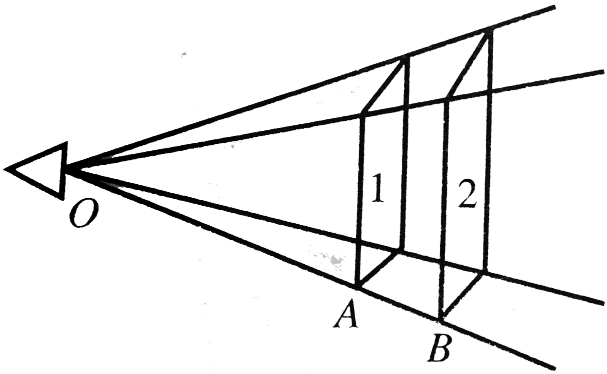

125.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2

having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. find the intensity at both the surfaces.

A. $I_1 = 12 \times 10^{-6} \frac{W}{m^2}, I_2 = 12 \times 10^{-6} \frac{W}{m^2}$

B. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 12 \times 10^{-9} \frac{W}{m^2}$

C. $I_1 = 6 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

D. $I_1 = 12 \times 10^{-9} \frac{W}{m^2}, I_2 = 3 \times 10^{-9} \frac{W}{m^2}$

Answer: C

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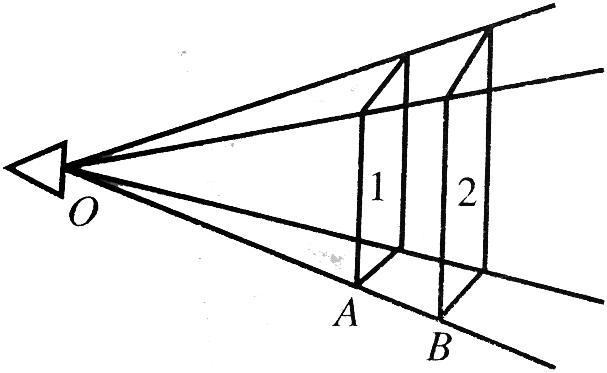

126.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. If two persons (having almost same physique) A and B are standing at the location

of surfaces 1 and 2, respectively, then who will hear a quiter sound?

A. Both will hear same sound.

B. A will bear a quiter sound

C. B will hear a quiter sound

D. information is not sufficient

Answer: C

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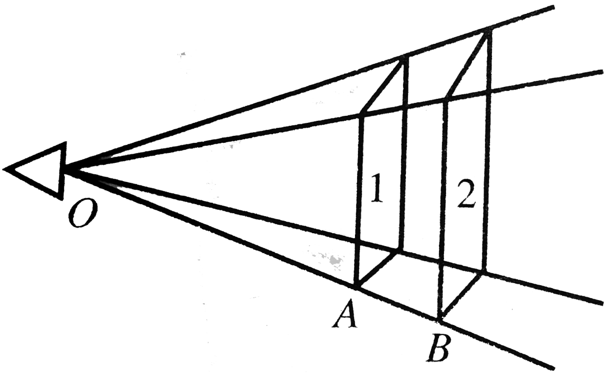

127.

In the figure shown below, a source of sound having power $12 \times 10^{-6} W$ is kept at O, which is emitting sound waves in the directions as shown. Two surfaces are labelled as 1 and 2 having areas $A_1 = 2 \times 10^3 m^2$ and $A_2 = 4 \times 10^3 m^2$, respectively

Q. Let the areas of the eardrums of persons A and B be $A_A = 2mm^2$ and $A_B = 4mm^2$,

respectively. Then who will hear a quiter sound?

A. A will hear a quiter sound.

B. B will hear quiter sound

C. Both will hear the same sound.

D. Cannot say anything.

Answer: C

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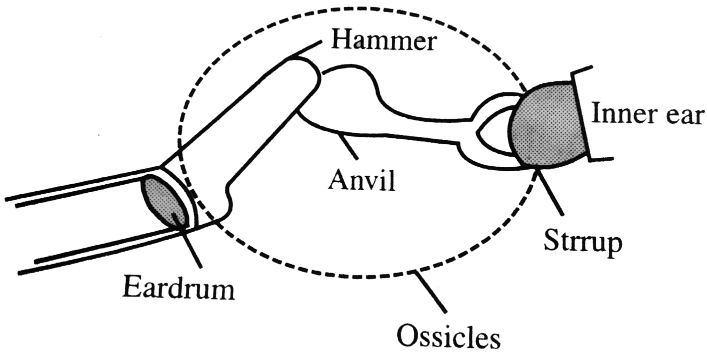

128.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^5 Pa$. Frequency of sound wave in air is $332 \frac{m}{s}$. Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^5 Pa$. Bulk modulus of fluid is $2.18 \times 10^9 Pa$.

Q. Find the pressure amplitude of given sound wave in the fluid of inner ear.

A. $0.03 Pa$

B. $0.04 Pa$

C. $0.3 Pa$

D. $0.4 Pa$

Answer: D

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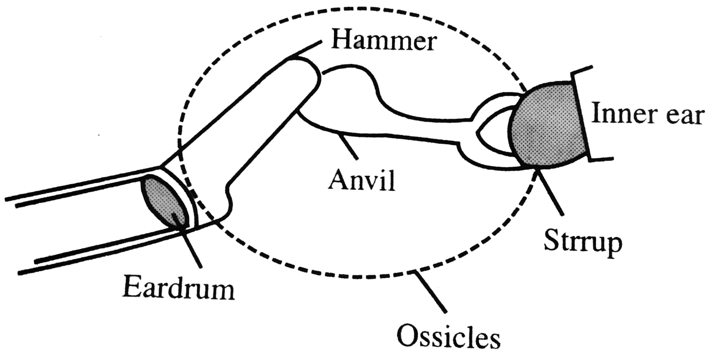

129.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50 mm^2$ and the area of stirrup is about $5 mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

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Q. Find the displacement amplitude of given sound wave in the fluid of inner ear.

A. $4.4 \times 10^{-11} m$

B. $8 \times 10^{11} m$

C. $3.65 \times 10^{-11} m$

D. $8.1 \times 10^{-12} m$

Answer: C

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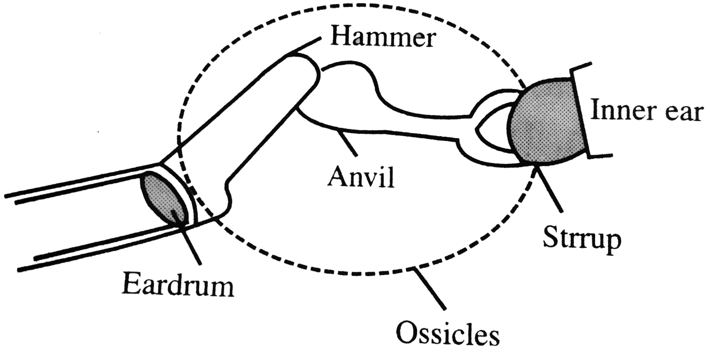

130.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

ossicles is same as the force exerted by ossicles on the inner ear. Consider a sound wave having maximum pressure fluctuation of $4 \times 10^{-2} Pa$ from its normal equilibrium pressure value which is equal to $10^{5} Pa.$ Frequency of sound wave in air is $332 \frac{m}{s}.$ Velocity of sound wave in fluid (present in inner ear) is $1500 \frac{m}{s}$. Bulk modulus of air is $1.42 \times 10^{5} Pa.$ Bulk modulus of fluid is $2.18 \times 10^{9} Pa.$

Q. If the person is using an hearing aid, which

increase the intensity of given sound wave change as perceived by inner ear?

A. 1000

B. 100

C. 10000

D. none of these

Answer: A

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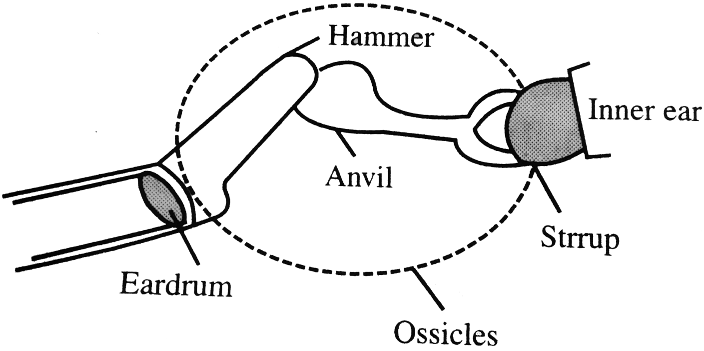

131.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

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Q. This person (without hearing aid machine) is sitting inside a busy restaurant where

average sound intensity is $3.2 \times 10^{-5} \frac{W}{m^2}$. How much energy in the form of sound is taken up by the person in his meal time of 1 h?

A. $1.2 \times 10^{-5} J$

B. $1.8 \times 10^{-4} J$

C. $2.4 \times 10^{-5} J$

D. $3.6 \times 10^{-4} J$

Answer: A

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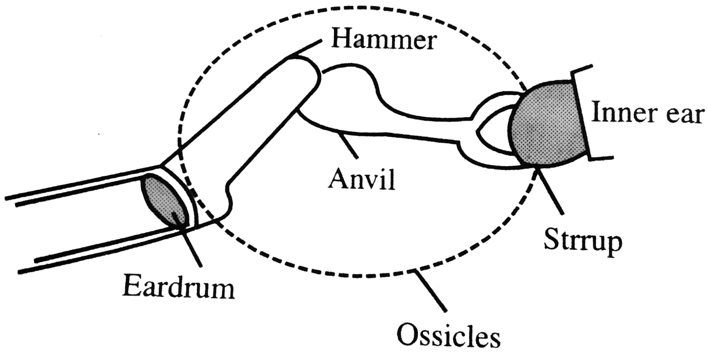

132.

When a sound wave enters the ear, it sets the eardrum into oscillation, which in turn causes oscillation of 3 tiny bones in the middle ear called ossicles. This oscillation is finally transmitted to the fluid filled in inner portion of the ear termed as inner ear, the motion of the fluid disturbs hair cells within the inner ear which transmit nerve impulses to the brain

with the information that a sound is present. The theree bones present in the middle ear are named as hammer, anvil and stirrup. Out of these the stirrup is the smallest one and this only connects the middle ear to inner ear as shown in the figure below. The area of stirrup and its extent of connection with the inner ear limits the sensitivity of the human ear consider a person's ear whose moving part of the eardrum has an area of about $50mm^2$ and the area of stirrup is about $5mm^2$. The mass of ossicles is negligible. As a result, force exerted by sound wave in air on eardum and

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Q. With respect to information provided above, mark the correct statement.

A. The person will hear more intense sound, if area of stirrup is reduced.

B. The person will hear more intense sound, if area of stirrup is increase.

C. If mass of ossicles is not negligible, then intensity of sound heard by the person increase.

D. If amss of ossicles is not negligible, then intensity of sound heard by the person remains same.

Answer: A

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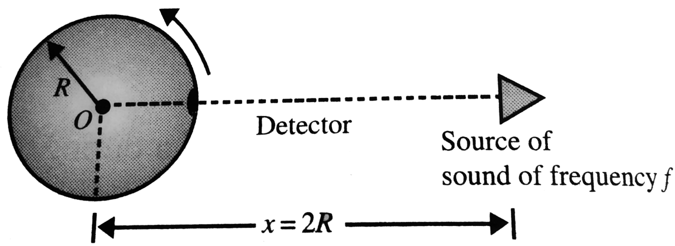

133.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise

direction at $t = 0$

(Take velocity of sound in air as v)

What is the frequency as received by detector, when it rotates by an angle $\frac{\pi}{2}$?

A. f

B. $\frac{v - \omega R}{v} \times f$

C. $\frac{v - \frac{\omega}{R}}{v} \times f$

D. $v - \frac{\omega R \times \frac{2}{\sqrt{5}}}{v} \times f$

Answer: D

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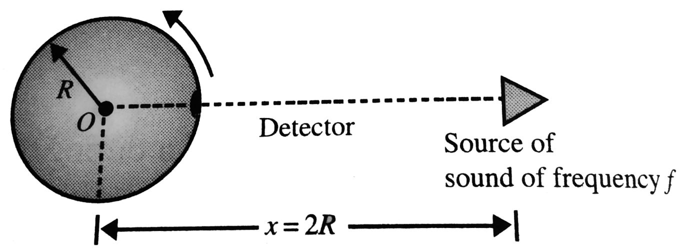

134.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Q. Find the time at which the detector will hear the maximum frequency for the first time.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: B

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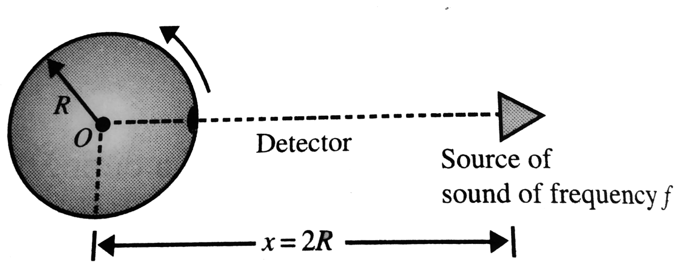

135.

A source of sound and detector are arranged as shown in Fig. The detector is moving along a circle with constant angular speed ω. It start from the shown location in anticlockwise direction at $t = 0$

(Take velocity of sound in air as v)

Find the time interval between minimum and

maximum frequency as received by the detector.

A. $\frac{\pi}{(3\omega)}$

B. $\frac{5\pi}{(3\omega)}$

C. $\frac{4\pi}{(3\omega)}$

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

Answer: C

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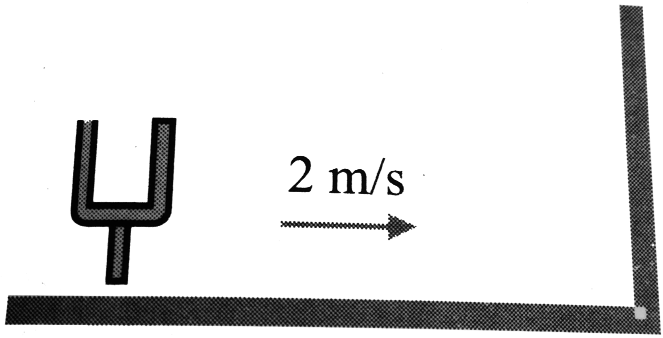

136.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. Suppose that a listener is located at rest between the tuning fork and the wall. Number

of beats heard by the listener per second will be

A. 4

B. 3

C. 0

D. 1

Answer: B

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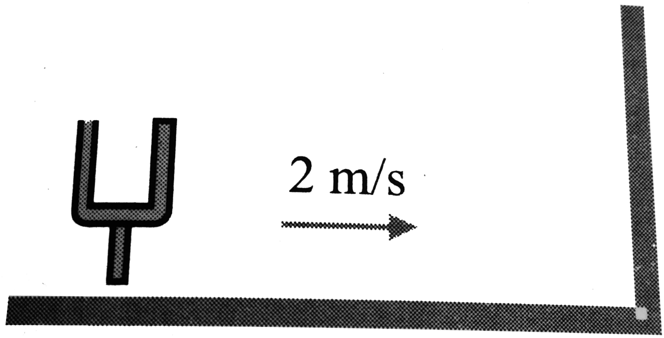

137.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener is at rest and located such that the tuning fork is moving between the

listener and the wall, number of beats heard by the listerner per second will be nearly

A. 0

B. 6

C. 8

D. 4

Answer: D

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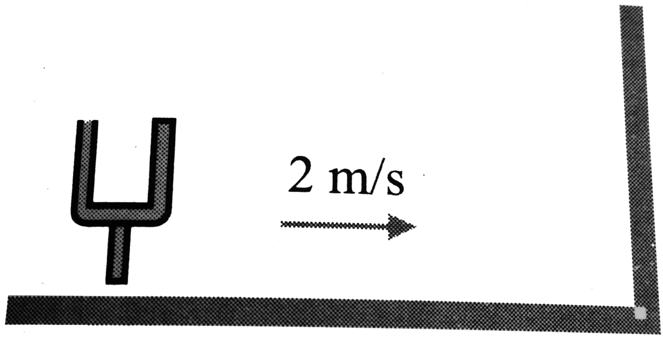

138.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listener, along with the source, is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that the source remains between

the listerner and the wall, number of beats heard by the listerner per second will be

A. 4

B. 8

C. 0

D. 6

Answer: B

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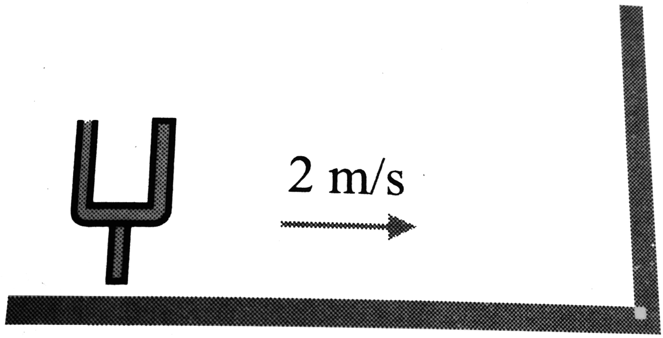

139.

As shown if Fig. a vibrating tuning fork of frequency 512 Hz is moving towards the wall with a speed $2\frac{m}{s}$. Take speed of sound as $v = 340\frac{m}{s}$ and answer the following questions.

Q. If the listerner along with the source is moving towards the wall with the same speed i.e., $2\frac{m}{s}$, such that he (listener) remains

between the source and the wall, number of beats heard by him will be

A. 2

B. 6

C. 8

D. 4

Answer: D

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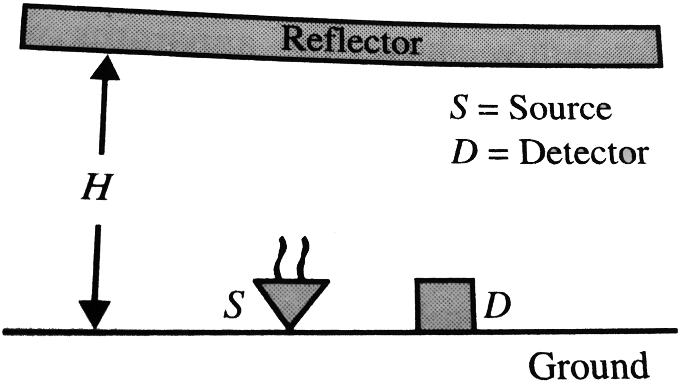
140. A source of sound with natural frequency $f_0 = 1800Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. Find the frequency of osund received by the observer at the moment when the source gets

closest to him.



A. 2000Hz

B. 6000Hz

C. 3000Hz

D. 5000Hz

Answer: C

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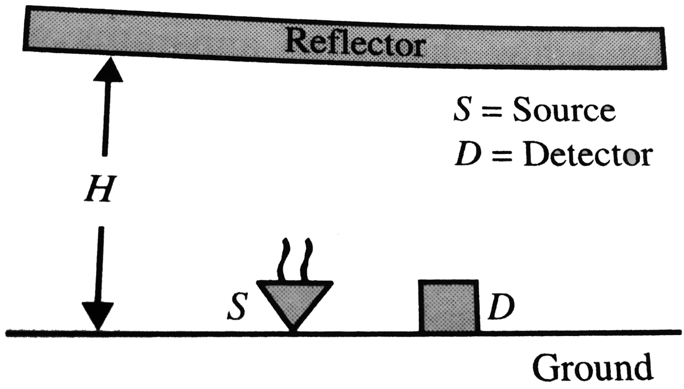
141. A source of sound with natural frequency $f_0 = 1800 Hz$ moves uniformly along a straight line separated from a stationary observer by a distance $l = 250 m$. The velocity of the source is equal to $\eta = 0.80$ fraction of the velocity of the sound.

Q. The distance between the source and the observer at the moment when the observer

receives a frequency $f = f_0$ is



A. $640m$

B. $420m$

C. $320m$

D. $250m$

Answer: A

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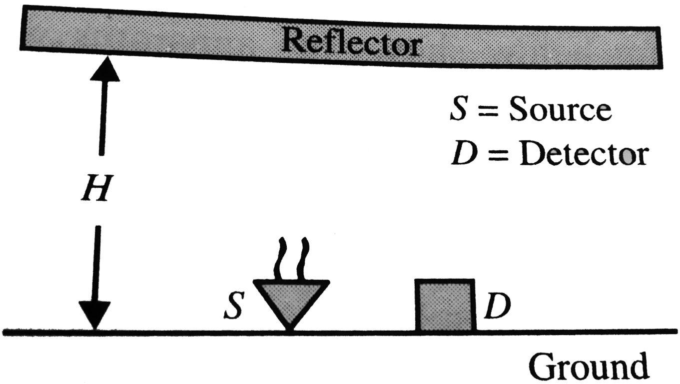

142.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0

At t - 0, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the following questions.

Q. Frequency of sound waves emitted by source at $t = \frac{v_0}{2g}$ is

A. f_0

B. $f_0\left[\frac{v}{v} + \frac{v_0}{2}\right]$

C. $f_0\left[\dfrac{\left(\dfrac{v-v_0}{2}\right)^2}{v}\right]$

D. $f_0\left[\dfrac{\dfrac{v-v_0}{2}}{\dfrac{v+v_0}{2}}\right]$

Answer: B

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143.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At $t - 0$, the vertical separation between the reflector and source is $H\left(\frac{> v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the frequency of sound waves emitted by source. Based on above information answer the

following questions.

Q. Wavelength of sound waves as received by detector before reflection at $t = \frac{v_0}{2g}$ is

A. $\frac{v}{f_0}$

B. $\frac{\frac{v+v_0}{2}}{f_0}$

C. $\frac{\left(\frac{v-v_0}{2}\right)^2}{vf_0}$

D. none of these

Answer: C

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144.

A source of sound and a detector are placed at the same place on ground At $t = 0$, the source S is projected towards reflector with velocity v_0 in vertical upward directon and reflector starts moving down with constant velocity v_0 At $t - 0$, the vertical separation between the reflector and source is $H\left(> \frac{v_0^2}{2g}\right)$. The speed of sound in air is $v\left(> > v_0\right)$, Take f_0 as the

frequency of sound waves emitted by source.

Based on above information answer the following questions.

Q. Frequency of sound received by detector after being reflected by reflector at $t = \frac{v_0}{2g}$ is

A. $\frac{2f_0\left(v + v_0\right)}{2v - v_0}$

B. $\frac{2f_0 v}{v - v_0}$

C. $2f_0\left[\frac{v + v_0}{2v - v_0}\right] \times \left[\frac{v}{v - v_0}\right]$

D. $2f_0 \times \frac{v + v_0}{v - v_0}$

Answer: C

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Integer

1. The average power transmitted across a cross section by two sound waves moving in the same direction are equal. The wavelength of two sound waves are in the ratio of $1:2$, then find the ratio of their pressure amplitudes.

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2. Loudness of sound from an isotropic point source at a distace of $70cm$ is $20dB$. What is the distance (in m) at which it is not heard.

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3. Two sound sources are moving away from a stationary observer in opposite direction with velocities V_1 and $V_2(V_1 > V_2)$. The frequency of both the sources is 900 Hz. V_1 and V_2 are both quite less than speed of sound, $V = 300\frac{m}{s}$. Find the value of $\left(V_1 - V_2\right)$ so that beat frequency observed by observer is 9 Hz. (in m/s).

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4. The resultant loudness at a point P is n dB higher than the loudness of S_1 whoch is one of the two identical sound sources S_1 and S_2

reaching at that point in phase. Find the value of n.

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5. The average power transmitted across a cross section by two sound waves moving in the same direction are equal. The wavelength of two sound waves are in the ratio of $1:2$, then find the ratio of their pressure amplitudes.

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6. Loudness of sound from an isotropic point source at a distace of $70cm$ is $20dB$. What is the distance (in m) at which it is not heard.

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7. Two sound sources are moving away from a stationary observer in opposite direction with velocities V_1 and $V_2(V_1 > V_2)$. The frequency of both the sources is 900 Hz. V_1 and V_2 are both quite less than speed of sound,

$V = 300\frac{m}{s}$. Find the value of $\left(V_1 - V_2\right)$ so that beat frequency observed by observer is 9 Hz. (in m/s).

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8. The resultant loudness at a point P is n dB higher than the loudness of S_1 which is one of the two identical sound sources S_1 and S_2 reaching at that point in phase. Find the value of n.

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9. The average power transmitted across a cross section by two sound waves moving in the same direction are equal. The wavelength of two sound waves are in the ratio of $1:2$, then find the ratio of their pressure amplitudes.

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10. Loudness of sound from an isotropic point source at a distace of $70cm$ is $20dB$. What is the distance (in m) at which it is not heard.

Watch Video Solution

11. Two sound sources are moving away from a stationary observer in opposite direction with velocities V_1 and $V_2\left(V_1 > V_2\right)$. The frequency of both the sources is 900 Hz. V_1 and V_2 are both quite less than speed of sound, $V = 300\frac{m}{s}$. Find the value of $\left(V_1 - V_2\right)$ so that beat frequency observed by observer is 9 Hz. (in m/s).

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12. The resultant loudness at a point P is n dB higher than the loudness of S_1 which is one of the two identical sound sources S_1 and S_2 reaching at that point in phase. Find the value of n.

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13. The average power transmitted across a cross section by two sound waves moving in the same direction are equal. The wavelength of two sound waves are in the ratio of $1:2$, then find the ratio of their pressure amplitudes.

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14. Loudness of sound from an isotropic point source at a distace of $70cm$ is $20dB$. What is the distance (in m) at which it is not heard.

Watch Video Solution

15. Two sound sources are moving away from a stationary observer in opposite direction with velocities V_1 and $V_2\left(V_1 > V_2\right)$. The frequency of both the sources is 900 Hz. V_1 and V_2 are both quite less than speed of sound, $V = 300\frac{m}{s}$. Find the value of $\left(V_1 - V_2\right)$ so that beat frequency observed by observer is 9 Hz. (in m/s).

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16. The resultant loudness at a point P is n dB higher than the loudness of S_1 which is one of the two identical sound sources S_1 and S_2 reaching at that point in phase. Find the value of n.

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