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# PHYSICS

# BOOKS - NAVNEET PUBLICATION

# STUDY OF SOUND

## Examples

**1.** How does the velocity of sound depend on its frequency?

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**2.** How is the direction of the oscillation of the particles of the medium related to the direction of propagation of the sound wave?

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**3.** How are the frequencies of notes sa, re, ga, ma, pa, dha, ni related to each other?

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**4.** What is the main difference between the frequencies of the voice of a man and that of a woman?

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## Exercise

**1.** Fill in the blanks with appropriate words and write the complete statements:

Sound waves and.....medium for propagation.

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**2.** Fill in the blanks with appropriate words and write the complete statements:

Sound produced by vibrations of a simple pendulum is .....sound.

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**3.** Fill in the blanks with appropriate words and write the complete statements:

The pitch of a sound depends upon.....of the wave.

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**4.** Fill in the blanks with appropriate words and write the complete statements:

Technique of echocardiography is based on the reflecting property of .....waves.

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**5.** Fill in the blanks with appropriate words and write the complete statements:

For determination of the depth of the sea.....technique is used.

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**6.** Fill in the blanks with appropriate words and write the complete statements:

The SI unit of frequency is the .....

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**7.** Fill in the blanks with appropriate words and write the complete statements:

Sound of frequency greater than 20kHz is called.....

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**8.** Fill in the blanks with appropriate words and write the complete statements:

In.....waves, the particles of the medium

vibrate perpendicular to the direction of wave propagation.

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**9.** Fill in the blanks with appropriate words and write the complete statements:

Sound waves are .....in nature.

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**10.** Choose the correct alternative and write it along with its allotted alphabet:

Which of the following is the requirement for regular reflection of sound?

A. smooth surface

B. Rough surface

C. Vacuum

D. Transparent rough surface

A. smooth surface

B. Rough surface

C. Vacuum

D. Transparent rough surface

**Answer: A**

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**11.** Choose the correct alternative and write it along with its allotted alphabet:

What can you say about the planes in which the incident and reflected sound waves lie?

A. Planes perpendicular to each other

B. The same plane

C. Planes parallel to each other

D. Two different planes

A. Planes perpendicular to each other

B. The same plane

C. Planes parallel to each other

D. Two different planes

**Answer: B**

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**12.** Choose the correct alternative and write it along with its allotted alphabet:

What is the measure of the angle made by the reflected sound with the reflecting surface when the angle incidence is $30^\circ$

A. $0^\circ$

B. $30^\circ$

C. $90^\circ$

D. $60^\circ$

A. $0^\circ$

B. $30^\circ$

C. $90^\circ$

D. $60^\circ$

**Answer: D**

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**13.** Sound will not travel through ..... .

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**14.** Fill in the blanks and explain:

The velocity of sound in steel is.....than the velocity of sound in water.

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**15.** Fill in the blanks and explain:

The incidence of.....in daily life shows that the velocity of sound is less than the velocity of light.

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**16.** Fill in the blanks and explain:

To discover a sunken ship or objects deep inside the sea,.....technology is used.

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**17.** State whether the following statements are True or False:

Wave speed, $v = \lambda T$

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**18.** State whether the following statements are True or False:

Infrasound has frequency greater than 20000 Hz.

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**19.** State whether the following statements are True or False:

Ultrasound has frequency less than 20Hz.

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**20.** State whether the following statements are True or False:

SONAR technique can be used to locate a submarine.

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**21.** State whether the following statements are True or False:

Ultrasonic waves are used to kill bacteria in liquids like milk.

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**22.** State whether the following statements are True or False:

The speed of sound in water is less than that in air.

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**23.** State whether the following statements are True or False:

The speed of sound in a solid is greater than that in a liquid.

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**24.** State whether the following statements are True or False:

Loudness is a measure of the response of the ear to the sound.

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**25.** State whether the following statements are True or False:

Infrasound is produced before earthquakes by vibrations of the earth's surface.

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**26.** State whether the following statements are True or False:

A hard and flat surface is a good reflector of sound.

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**27.** State whether the following statements are

True or False:

Cloths, curtains are bad reflectors of sound.

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**28.** Find the odd one out and give the reason:

Paper, clothes, mat, metal sheet.

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**29.** Find the odd one out and gice the reason:

Sound waves, waves on the surface of water, waves on a stretched string, light waves.

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**30.** Match the following :

| Column 'A' | Column 'B' |
|---|---|
| (1) Infrasound | (a) Frequency less than 20 Hz |
| (2) Ultrasound | (b) Frequency greater than 20000 Hz |
| | (c) Frequency range : 20 Hz – 20000 Hz |
| | (d) Frequency range : 10 Hz – 2000 Hz |

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**31.** Answer the following questions:

What is sound?

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**32.** Answer the following questions:

What is vibration? Give one example.

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**33.** Answer the following questions:

What is wave?

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**34.** What is wave motion ?

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**35.** Answer the following questions:

How is sound produced? How does it

propagate? Can it travel through a vacuum?

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**36.** Answer the following questions:

Define compression

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**37.** Answer the following questions:

Define Rarefaction.

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**38.** Answer the following questions:

Define wavelength.

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**39.** Answer the following questions:

Define one oscillation/vibration.

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**40.** Answer the following questions:

Define frequency.

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**41.** Answer the following questions:

Define time period.

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**42.** Define amplitude of the wave.

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**43.** Answer the following questions:

Define speed of sound.

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**44.** Answer the following questions:

Define intensity of sound.

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**45.** Answer the following questions:

Which type of waves are sound waves? State their characteristics?

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**46.** Answer the following questions:

What are the SI units of wavelength and frequency?

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**47.** Answer the following questions:

The frequency of vibration of a string is 100Hz.

What do you understand by the statement?

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**48.** Answer the following questions:

What is the relation between the frequency and the time period? If the frequency is 100Hz, what is the time period?

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**49.** Answer the following questions:

How are the speed, frequency, time period and wavelength of sound related?

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**50.** Answer the following questions:

State how the velocity (or speed) of sound in a gas depends upon various factors.

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**51.** The molecular weight of oxygen gas (02) is 32 while that of hydrogen gas (H2) is 2. Prove that under the same physical conditions, the velocity of sound in hydrogen is four times that in oxygen.

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**52.** Answer the following questions:

What can you say about vibration of the speed of sound in air, under given physical conditions, with frequency?

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**53.** Answer the following questions:

What can you say about variation of the speed of sound in air with temperature?

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**54.** Answer the following questions:

Arrange the following materials in order of decreasing speed of sound at a given

temperature (say, $25^{\circ} C$): oxygen, glass, water, aluminium.

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**55.** The audible range of sound for human being.

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**56.** Answer the following questions:

What do infrasound and ultraosund refer to ?

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**57.** Answer the following questions:

Read the following sequence of events and answer the questions based on the same.

Ranjit saw that the dog sitting by his side had suddenly become alert. In a short time, Ranjit heard footsteps of a man and the stranger approached Ranjit. Rajit now understood why the dog had suddenly become alert.

What is the difference between the audible range of sound for Ranjit and the dog?

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**58.** Answer the following questions:

Read the following sequence of events and answer the questions based on the same.

Ranjit saw that the dog sitting by his side had suddenly become alert. In a short time, Ranjit heard footsteps of a man and the stranger approached Ranjit. Rajit now understood why the dog had suddenly become alert.

Name some other animals that can hear

sound of frequency not audible to human beings.

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**59.** Answer the following questions:

State one similarity and one difference regarding reflection of sound and light.

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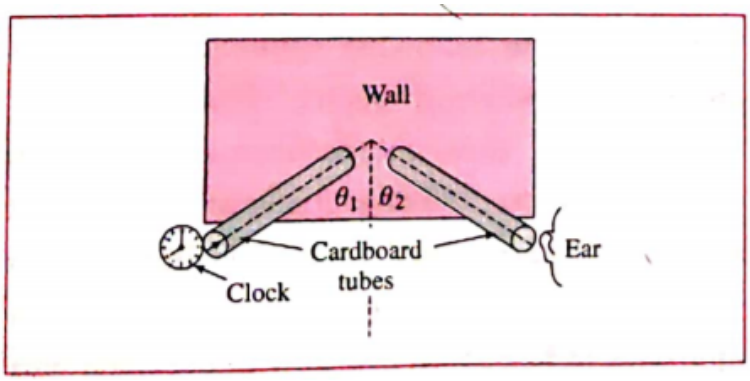
**60.** Answer the following questions:

Make two sufficiently long, identical tubes out of a cardboard.

Arrange them on a table, in front of a wall as shown in figure. what did you observe?

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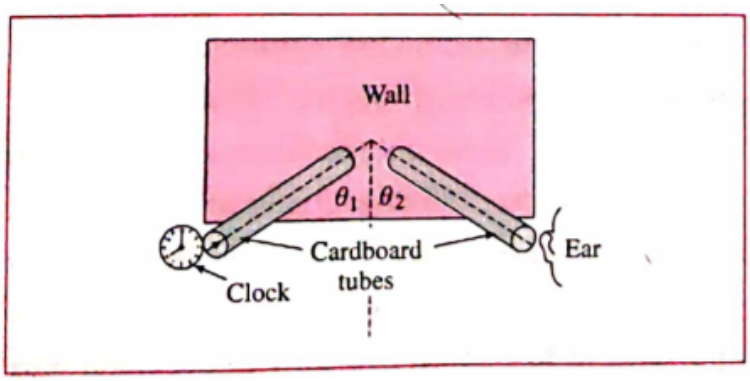
**61.** Answer the following questions:

place a clock near the end of the tubes and try to hear the ticking of the clock at the end of the other tube by placing your ear there. what do you observe?

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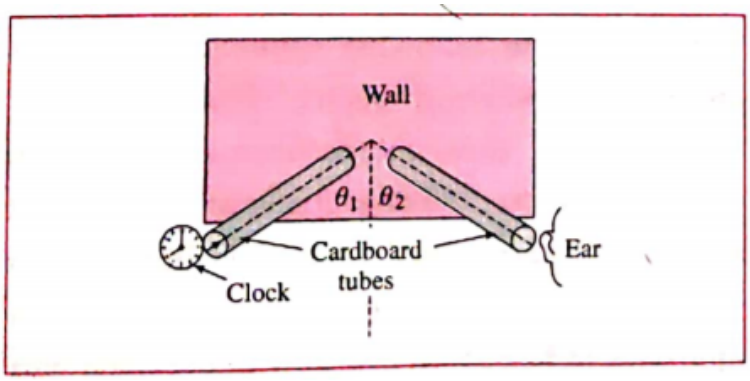
**62.** Answer the following questions:

Adjust the angles of the two tubes till you can hear the sound very clearly. Measure the angle of incidence $\theta 1$ and the angle of reflection $\theta 2$. Give your opinion

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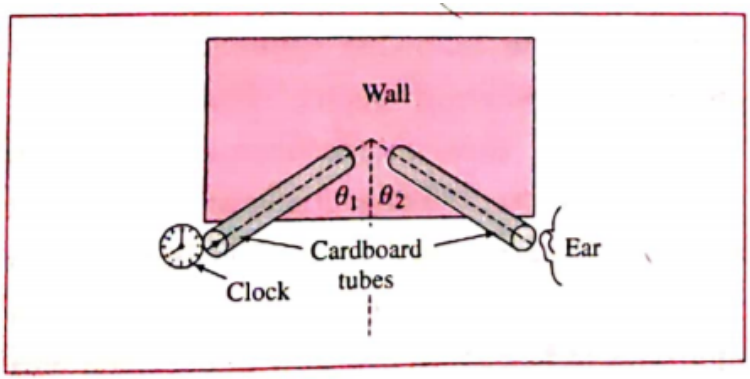
**63.** Answer the following questions:Make two sufficiently long, identical tubes out of a cardboard. Arrange them on a table, in front of a wall as shown in figure . Place a clock near the end of one of the tubes and try to hear the ticking of the clock at the end of the other tube by placing your ear there. Adjust the angles of the two tubes till you can hear the sound very clearly

Measure the angle of incidence $\theta_1$ and the angle of reflection$\theta_2$. Try to see if they are related in any way. In the experiment, what will

happen if you lift one of the tubes to some height?

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**64.** Answer the following questions:

Define echo.

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**65.** Answer the following questions:

The speed of sound in air at $22^{\circ} C$ is $344 m / s$. Find the corresponding condition for hearing distinct echo in terms of the distance between the source of sound and obstacle.

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**66.** What is an echo? What factors are important to get a distinct echo?

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**67.** Answer the following questions:

Study the construction of the Golghumat at Vijapur and discuss the reasons for the multiple echoes produced there.

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**68.** Answer the following questions:

What should be the dimensions and the shape of classrooms so that no echo can be produced there?

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**69.** Where and why are sound absorbing materials used?

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**70.** To hear the echo distinctly,will the distance from the source of sound to the reflecting surface be same at all temperatures? Explain your answer.

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**71.** When is the reflection of sound harmful?

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**72.** Answer the following questions:

Explain how a bat can find its way in the dark.

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**73.** We cannot hear the echo produced in a classroom.

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**74.** Answer the following questions:

Sometimes reflections of sound may be undesirable. Can you give some example?

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**75.** Answer the following questions:

What is reverberation?

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**76.** Answer the following questions:

Why are ceilings of concert halls and cinema halls curved?

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**77.** Answer the following questions:

How will you reduce reverberation in public halls or buildings?

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**78.** Write short note on Ultrasound.

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**79.** Write in short note on SONAR?

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**80.** Write short note on Reverberation.

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**81.** Write short note on Sonogaphy. How is it misused.

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**82.** The roof of a movie theatre and a conference hall is curved.

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**83.** The intensity of reverberation is higher in a closed and empty house.

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**84.** We cannot hear the echo produced in a classroom.

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**85.** Solve the following example:

A sound wave passes over a fixed point in space. Ten compression and ten rarefactions pass the point in 0.1 second. Find the frequency and time period of the wave.

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**86.** Solve the following example:

If the time period of a wave if 0.004s, find the frequency of the wave.

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**87.** Solve the following example:

A sound wave having certain frequency travels with a speed of $336m/s$ and wavelength 3 cm. Calculate the frequency. Will it be audible?

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**88.** A sound wave has frequency 320 Hz and wavelength 0.25 m. How much distance will it travel in 10 second?

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**89.** Solve the following example:

A source of sound has frequency 1000Hz. If the speed of sound in air under certain conditions

is 340 m/s, find the distance covered by sound when the source completes 100 vibrations.

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**90.** Solve the following example:

A sound wave has wavelength 0.85 m in air and 0.9 m in a gas. The speed of sound in air is $340 m / s$. Find the frequency of sound and the speed of sound in the gas.

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**91.** Solve the following example:

A sound wave has wavelength 0.86 m and speed $344m/s$ in air. If its wavelength in a gas in 0.8 m, Find the speed of sound of sound in the gas.

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**92.** Solve the following example:

A person standing before a cliff shouts and hears the echo afte 1.6 s. Find the distance

between the person and the cliff. (speed of sound in air= $340 m / s$)

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**93.** Solve the following example:

A person standing between two hills fired a gun and heard the first echo after 0.5 s and the second echo after 0.9 s. Find the distance between two hills. (speed of sound in air $= 340 m / s$)

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**94.** Nita heard the sound of lightning after 4 seconds of seeing it. What was the distance of the lightning from her?

(The velocity of sound in air is $340 m / s$)

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**95.** Sunil is standing between two walls. The wall closest to him is at a distance of 660 m. If he shouts, he hear the first echo after 4 s and

another after another 2 seconds.

What is the velocity of sound in air?

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**96.** Sunil is standing between two walls. The wall closest to him is at a distance of 660 m. If he shouts, he hear the first echo after 4 s and another after another 2 seconds.

What is the distance between the two walls?

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**97.** Hydrogen gas is filled in two identical bottles, A and B, at the same temperature. The mass of hydrogen in the two bottles is 12 gm and 48 gm respectively. In which bottle will sound travel faster? How mant times as fast as the other?

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**98.** Helium gas is filled in two identical bottles A and B. The mass of the gas in the two bottles is 10 gm and 40 gm respectively. If the

speed of sound is the same in both bottles, what conclusions will you draw?

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**99.** The speed of sound in air at $0^{\circ}C$ is $332m/s$. If it increases at the rate of $0.m/s$ per degree, what will be the temperature when the velocity has increased to $344m/s$?

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**100.** A wave passes over a fixed point in space. If 20 compressions and 20 rarefaction pass the point in 0.1 s, find the frequency and time period of the wave.

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**101.** If the period of a wave is $2 \times 10^{-3}$s, find the frequency of the wave.

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**102.** A sound wave of wavelength 4 cm travels with a speed of $360 m / s$.Find its frequency.

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**103.** A sound wave of frequency 8000Hz travels with a speed of $340 m / s$ in air. Find its wavelength.

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**104.** A sound wave has frequency 400 Hz and wavelength 0.9m. How much distance will it cover in 1.5 s?

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**105.** A source of sound has frequency 2000 Hz. If the speed of sound in air $340m/s$, find the distance covered by sound when the source completes 400 vibrations.

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**106.** A sound wave has wavelength 0.87m in air and 0.88m in a gas. The speed of sound in air is $348m/s$. Find the frequency of sound and the speed of sound in the gas.

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**107.** A sound wave has wavelength 0.86m and speed $344m/s$ in air. If its wavelength in a gas is 0.82m, find the speed of sound in the gas.

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**108.** A person standing before a cliff shouts and hears the echo after 1.9s. Find the distance between the person and the cliff. (speed of sound in air=340 m/s`)

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**109.** A person standing between two hills fired a gun heard the first echo after 0.6s and the second echo after 1s. Find the distance

between the two hills. (speed of sound in air $= 340m/s$)

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**110.** A soldier standing between two hills hears two echoes after firing the gun. The first echo is heard after 1.2s and the second echo after 2.4s. Find the separation between the two hills.(speed of sound in air =$340m/s$)

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**111.** The speed of the sound in air at $0^\circ C$ is $332 m/s$. Find the speed of sound in air at $10^\circ C$.

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