PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

ACOUSTICS

Textual Solved Problems

1. At what tempreature will the velocity of sound in air be double the velocity of sound in air at $0^\circ C$?

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2. A source producing a sound of frequency 90 Hz is approaching a stationary listener with a speed equal to (1/10) of the speed of sound. What will be the frequency heard by the listener?

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3. A source producing a sound of frequency 500 Hz is moving towards is listener with a velocity of 30 ms^{-1}. The speed of the sound is $330ms^{-1}$. What will be the frequency heard by listener?

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4. A source of sound is moving with a velocity of $50ms^{-1}$ towards a stationary listener. The listener measures the frequency of the source as 1000Hz. What will be the apparent frequency of the source when it is moving away from the listener after crossing him? (velocity of sound in the medium is $330ms^{-1}$).

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5. A source and listener are both moving towards each other with a speed $v/10$ where v is the speed of sound. If the frequency of the note emitted by the source is f, what will be the frequency heard by the listener?

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6. At what speed should a source of sound move away from a stationary observer so that observer finds the apparent frequency equal to half of the original frequency?

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1. When a sound wave travels through air, the air particles ....

   A. vibrate along the direction of the wave motion

   B. vibrate but not in any fixed direction

   C. vibrate perpendicular to the direction of the wave motion

   D. do not vibrate

Answer: A::B::C::D

2. Velocity of sound in a gaseous medium is $330ms^{-1}$. If the pressure is increased by 4 times without causing a change in the temperature, the velocity of sound in the gas is ....

A. $330ms^{-1}$

B. $660ms^{-1}$

C. $156ms^{-1}$

D. $990ms^{-1}$

Answer: A::C

3. The frequency, which is audible to the human ear is

    A. 50kHz

    B. 20kHz

    C. 15000kHz

    D. 10000kHz

Answer: B

4. The velocity of sound in air at a particular temperature is $330ms^{-1}$. What will be its value when temperature is doubled and the pressure is halved?

A. $330ms^{-1}$

B. $165ms^{-1}$

C. $330 \times \sqrt{2}ms^{-1}$

D. $320/\sqrt{2}ms^{-1}$

Answer: A::B::C

5. If a sound wave travels with a frequency of $1.25 \times 10^4 Hz$ at $344 ms^{-1}$, the wave length will be

    A. 27.52m

    B. 275.2m

    C. 0.02752m

    D. 2.752m

Answer: B

6. The sound waves are reflected from an obstacle into the same medium from which they were incident .Which of the following changes ?

    A. speed

    B. frequency

    C. wavelength

    D. none of these

Answer:

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7. velocity of sound in the atmosphere of a planet is 500ms^-(1). The minimum distance between the sources of sound and the obstacle to hear the echo, should be

    A. 17 m

    B. 20 m

    C. 25 m

    D. 50 m

Answer: B

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1. Rapid back and forth motion of a particle about its mean position is called _____.

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2. With propogation of longitudinal waves through a medium the quantity transmitted is

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3. A whistle giving out a sound of frequency $450 Hz$, approaches a stationary observer at a speed of $33 m s_1$. The frequency heard by the observer is (speed of sound $= 330 m s_1$____.

4. A source of sound is travelling with a velocity 40 km/h towards an observer and emits a sound of frequency 2000 Hz. If the velocity of sound is 1220 km/h, then the apparent frequency heard by the observer is. ....

1. Sound can travel through solids, gases, liquids and even vacuum.

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2. Waves created by Earth Quake are infrasonic.

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3. True or False. The velocity of sound is independent of temperature .

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4. The speed of sound is ____ in solids than in liquids.

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Textual Evaluation Iv Match The Following

1.

1.	Infrasonic	—	(a)	Compressions
2.	Echo	—	(b)	$22 kHz$
3.	Ultrasonic	—	(c)	$10 Hz$
4.	High pressure region	—	(d)	Ultrasonography

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Textual Evaluation V Assertion And Reason Type Questions Mark The Correct Choice

1. Assertion: The change in air pressure affects the speed of sound.

Reason: The speed of sound in a gas is proportional to the square of the pressure

2. Assertion: Sound travels faster in solids than in gases.

Reason : Solid posses a greater density than that of gases.

A. If both the assertion and the reason are true and the reason is the correct explanation of the assertion.

B. If both the assertion and the reason are true but the reason is not the correct explanation

of the assertion

C. Assertion is true, but the reason is false.

D. Assertion is false, but the reason is true.

Answer: If both the assertion and the reason are true but the reason is not the correct explanation of the assertion

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Textual Evaluation Vi Answer Very Briefly

1. What are longitudinal waves? Give one example.

2. What is the audible range of frequency?

3. What is the minimum distance needed for an echo?

4. What will be the frequency sound having 0.20 m as its wavelength, when it travels with a speed of

$331 ms^{-1}$?

5. Name three animals, which can hear ultrasonic vibrations.

Textual Evaluation Vii Answer Briefly

1. Why does sound travel faster on a rainy day than on a dry day?

2. Why does an empty vessel produce more sound than a filled one?

3. Air temperature in the Rajasthan deserrt can reach $46°C$. What is the velocity of sound in air at that temperature ? $(V_0 = 331ms^{-1})$.

4. Explain why, the ceilings of concert halls are curved.

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5. Mention two cases in which there is no Doppler effect in sound?

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Textual Evaluation Viii Problem Corner

1. A sound wave has a frequency of 200 Hz and a speed of $400ms^{-1}$ in a medium. Find the wavelength of the sound wave.

2. The thunder of cloud is heard 9.8 seconds later than the flash of lightning. If the speed of sound in air is $330ms^{-1}$, what will be the height of the cloud?

3. A person who is sitting at a distance of 400 m from a source of sound is listening to a sound of 600 Hz. Find the timee period between successive compressions from the source?

4. An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the transmission and reception of the wave is 1.6 seconds. What is the depth of the sea, if the velocity of sound in the seawater is $1400ms^{-1}$

5. A man is standing between two vertical walls 680m apart. He claps his hands and hears two distinct echoes after 0.9 seconds and 1.1 second respectively. What is the speed of sound in the air?

6. Two observers are stationed in two boats 4.5 km apart. A sound signal sent by one, under water, reaches the other after 3 seconds. What is the speed of sound in the water?

7. A strong sound signal is sent from a ship towards the bottom of the sea. It is received back after 1s. What is the depth of sea given that the speed of sound in water $1450ms^{-1}$?

Textual Evaluation Ix Answer In Detail

1. What are the factors that effect the speed of sound in gases?

2. What is mean by rellection of sound? Explain.

(a) Reflection at the boundary of a rarer medium

(b) Reflection at the boundary of a denser medium

(c) Reflection at sound in curved surfaces

3. (a) What do you understand by the term 'ultrasonic vibration'?

(b) State three uses of ultrasonic vibrations.

(c) Name three animals which can hear ultrasonic vibrations.

4. What is an echo?

(a) State two conditions necessary for hearing an echo.

(b) What are the medical applications of echo?

c) How can you calculate the speed of sound using echo?

1. Suppose that a sound wave and a light wave have the same frequency, then which one has a longer wavelength?

    A. Sound

    B. Light

    C. both (a) and (b)

    D. data not sufficient

Answer: Light

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2. When sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound remain the same. Do you hear an echo sound on a hotter day? Justify your answer.

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Additional Questions I Choose The Best Answer

1. Light can travel in a vaccum but not sound because ....

A. speed of sound is very slow than light.

B. light waves are electromagnetic in nature.

C. sound waves are electromagnetic in nature

D. light waves are not electromagnetic in nature.

Answer: A::D

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2. Velocity of sound in air is ....

A. faster in dry air than in moist air.

B. directly proportional to temperature.

C. directly proportional to pressure.

D. Slower in dry air than in moist air.

Answer: A::C::D

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3. When sound travels from air to water, which parameter does not change?

A. Wavelength

B. Frequency

C. Velocity

D. Temperature

Answer: C

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4. The apaarent frequency in Doppler's effect does not depend upon :

A. Speed of the listener.

B. Distance between the listener and source.

C. Speed of the source.

D. Frequency of the source

Answer: A::B::C::D

5. At what temperature, the speed of sound in the air will become double of its value at $27°C$?

A. $54°C$

B. $627°C$

C. $327°C$

D. $927°C$

Answer: B::C

6. The speed of a wave in medium is $760ms^{-1}$. If 3600 waves cross a point in the medium in 2 minutes, then the wavelength of the wave is :

A. 13.8m

B. 41.5m

C. 25.3m

D. 57.2m

Answer: B::C

1. Sound waves in gas is. ....

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2. Velocity of sound is the largest in ....

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3. Hertz is the unit of ....

4. Sound travels in rocks in the form of ....

5. Velocity of sound varies directly as the square root of the

6. Reflection of sound waves obey the

7. What does RADAR stand for ?

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8. The abbreviation of SONAR IS ....

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Additional Questions Iii Match The Following

1.

Medium		Speed of sound (ms^{-1})
(i) Copper	$-$	(a) 343
(ii) Water	$-$	(b) 331
(iii) Air $(0°c)$	$-$	(b) 5010
(iv) Air $(at 20°c)$	$-$	(d) 1493

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2.

Waves		Range
(i) Audible	$-$	(a) $340 ms^{-1}$
(ii) Sound	$-$	(b) greater then $20 kHz$
(iii) Infrasonic	$-$	(c) $20 - 20 kHZ$
(iv) Light	$-$	(d) below $20 Hz$
(v) Ultrasonic	$-$	(e) $3 \times 10^8 ms^{-1}$

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1. Assertion : Sound wave cannot propagate through vacuum but light can.

Reason : Sound wave cannot be polarised but light can.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but the reason is not the correct explanation of the

assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: Both assertion and reason are true but the reason is not the correct explanation of the assertion

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2. Assertion: The velocity of sound increases with increase in humidity. Reason : Velocity of sound does not depend upon the medium.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but the reason is not the correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: Assertion is true but the reason is false.

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1. What is sound? Is it a force or energy?

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2. How is sound produced?

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3. How does sound reach our ears from various sources?

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4. Why don't we hear sounds when our ears are closed?

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5. Suppose you and your friend are on the Moon. Will you be able to hear any sound produced by your friend?

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6. What do you understand by the term 'infrasonic vibration"?

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7. Write down the difference between the sound and light waves.

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8. Define particle velocity.

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9. Define wave velocity.

▶ **Watch Video Solution**

10. Define velocity of a sound wave.

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11. What are the factors that effect the speed of sound in gases?

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12. State the laws of reflection.

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13. What is meant by rarer and denser medium?

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Additional Questions Vi Problem Corner

1. A wave of length 0.60 cm is produced in air and travels with a velocity of $340ms^{-1}$. Will it be

audible to human ear?

2. Consider a source moving towards an listener at a speed of 0.9v. Where v is the velocity of sound. Calculate the apparent frequency if the actual frequency is 600 Hz.

3. A train moving with a velocity $30ms^{-1}$ blows a whistle of frequency 516 Hz. Find the pitch of the

sound heard by a passenger in another train approaching the first at a speed of $15ms^{-1}$, velocity of sound = $330ms^{-1}$.

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Additional Questions Vii Answer In Detail

1. Write down the applications of echo.

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2. Explain in the details of measuring velocity of sound by Echo method.

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3. Write down the concept of ear trumpet and Mega phone.

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4. What is Doppler effect? Derive the formula for the change in apparent frequency

(i) Both source and listener move towards and away from each other.

(ii) Both source and listaner move one behind the other source follows the listener and listener follows the source.

(iii) Source at rest, listener moves towards and away from the source.

(iv) Listener at rest, source moves towards and away from the listener.

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5. Explain various applications of Doppler effect.

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