

Test NO.2
UNIT NO. 11

-019 (Class :- 10th)

PHYSICS

Time Allowed: 15 Minutes

Paper: (Objective Type)
Maximum Marks: 12

Note : You have four choices for each objective type question as A,B,C and D. The choice which you think is correct fill that circle in front of that question number. Use marker or pen in fills this circle. Cutting or filling two or more circles will result in zero mark in that question.

Q.1	QUESTIONS	(A)	(B)	(C)	(D)
1.	The unit of intensity of sound.	Wm^{-1}	Wm	Wm^{-2}	Wm^{-3}
2.	The sound level of rustle of leaves is.	10 dB	20 dB	25 dB	30 dB
3.	The characteristic of sound by which two sounds of some loudness and pitch are distinguished, is called	Noise	Music	Quality of sound	Pitch of Sound
4.	Which is example of longitudinal wave?	Sound wave	Light wave	Radius wave	Water wave
5.	The speed of sound in air at 0 °C is	$331ms^{-1}$	$332ms^{-1}$	$333ms^{-1}$	$336ms^{-1}$
6.	The frequency of silent whistle is.	20,000 Hz-25000Hz	2000 Hz-25000Hz	200 KHz-2000Hz	25000KHz
7.	Which form of energy is sound?	Electrical	Mechanical	Thermal	Chemical
8.	The loudness of a sound is most closely related to its.	Frequency	Period	Wavelength	Amplitude
9.	The speed of sound in air at 21 °C is.	$336ms^{-1}$	$343ms^{-1}$	$430ms^{-1}$	$470ms^{-1}$
10.	Frequency of tuning fork depends upon its of ____ prongs.	Weight	Speed	Mass	Distance
11.	Old people cannot hear sound above than Hz	1000	15000	20000	10000
12.	The speed of sound in iron at 25 °C is ms^{-1}	5950	5900	6950	6940

A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	☐	☐	☒	☐	4	☒	☐	☐	☐	7	☐	☒	☐	☐	10	☐	☐	☒	☐
2	☒	☐	☐	☐	5	☒	☐	☐	☐	8	☐	☐	☐	☒	11	☐	☒	☐	☐
3	☐	☐	☒	☐	6	☒	☐	☐	☐	9	☐	☒	☐	☐	12	☒	☐	☐	☐
	☐	☐	☐	☒		☐	☐	☐	☒		☐	☐	☐	☒		☐	☐	☐	☒

نوٹ: معروضی سوال نامے کو توجہ سے پڑھیں اور ہر MCQ کی درست آپشن A,B,C,D کو چنیں کی سیاتی یا مار کر سے اس طرح پُر کریں کہ سیاتی دائرے سے باہر نہ نکلے۔ ایک سے زیادہ دائروں کو پُر کرنے یا کاٹ کر پُر کرنے کی صورت میں مذکورہ جواب غلط تصور ہوگا۔

(PART – I)

10

2. Write short answers to any Five (5) questions:

- (i) What is sound wave?
- (ii) What is tuning fork?
- (iii) Define Longitudinal Waves.
- (iv) Define Loudness.
- (v) Define Amplitude.
- (vi) Define pitch and quality.
- (vii) Is speed of sound more in solids or liquids? And why?
- (viii) We can recognize person speaking with the same loudness from their voice. How is this possible?

10

3. Write short answers to any Five (5) questions:

- (i) What is Intensity of sound?
- (ii) What is bel and Zero bel.
- (iii) What is Intensity level?
- (iv) How can depth of sea be measured by ultrasonic?
- (v) What is decibel scale?
- (vi) Is there any difference between echo and reflection of sound? Explain.
- (vii) What is speed of sound?
- (viii) What is difference between frequency and pitch?

10

4. Write short answers to any Five (5) questions:

- (i) Why Ultrasound is useful in medical field.
- (ii) On what factors does the loudness of sound depend?
- (iii) What is Musical sound?
- (iv) What is noise?
- (v) Define Acoustic protection.
- (vi) Define audible frequency range.
- (vii) What is the audible frequency range for human ear?
- (viii) Will two separate 50 db sound together constitute a 100 dB sound? Explain.

(PART- II)

Note: Attempt any TWO questions.

- 5- (a) Explain reflection of sound.
4
of 5 (b) Calculate the wavelength of sound produced by tuning fork of frequency 512 Hz. Whereas the speed of sound in air is 140 ms^{-1}
- 6- (a) What do you understand by the longitudinal wave? Describe the longitudinal nature of sound waves.
4
(b) A normal conservation involves sound intensities of about $3.0 \times 10^{-6} \text{ Wm}^{-2}$. What is the decibel level for this intensity?
5
- 7- (a) Explain the characteristic of sound.
4
(b) A sound wave has a frequency of 2 kHz and wavelength 35 Cm. How long will it take to travel 1.5 km?
5



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PHYSICS

(PART - I)

Question : 2

Write short answers to any five questions:

(i) What is sound wave?

Sound wave :-

Sound is a form of energy that is passed from one point to another in the form of longitudinal waves. Sound is produced by a vibrating body.

(ii) What is tuning fork?

Tuning fork :-

Tuning fork is a device that we use to produce a particular sound. If we strike the tuning fork against rubber hammer, the tuning fork will begin to vibrate and produce a sound by it.

(iii) Define Longitudinal Waves.

Longitudinal Waves :-

"In longitudinal or

compressional waves the particles of the medium vibrate parallel to the direction of propagation of wave."

For example:

Sound waves

(iv) Define Loudness.

Loudness:-

Loudness is the characteristics of sound by which loud and faint sounds can be distinguished.

(v) Define Amplitude.

Amplitude:-

The maximum displacement of a vibrating body on either side from its mean position is called its amplitude.

(vi) Define pitch and quality.

Pitch:-

Pitch is the characteristic of sound by which we can distinguish between a shrill and a grave sound.

Quality :-

The characteristic of sound by which we can distinguish between two sounds of same loudness and pitch is called quality.

(Vii) Is speed of sound more in solids or liquids? And why?

Speed of sound in solids is more than in liquids because the solid atoms are closely packed whereas molecules of liquids are far apart.

(Viii) We can recognize persons speaking with the same loudness from their voice. How is this possible?

We can recognize person speaking with same loudness from their voice because sound waves have different waveforms, so their quality is different and we can distinguish them from each other.

Question : 3

Write short answers to any five questions:

(i) What is Intensity of sound?

Intensity of Sound :-

"Sound energy passing per second through a unit area held perpendicular to the direction of propagation of sound waves is called intensity of sound."

The unit of intensity of sound is watt per square metre (Wm^{-2}).

(ii) What is bel and Zero bel?

Bel :-

If intensity I of any unknown sound is 10 times greater than the intensity I_0 of the faintest audible sound i.e., $I = 10I_0$ is called bel.

Zero Bel :-

Faintest audible sound having intensity 10^{-12} Wm^{-2} is called Reference intensity or zero bel.

(iii) What is Intensity Level?

Intensity Level :-

Difference ($L - L_0$) between the loudness L of an unknown

sound and the loudness L_0 is called the intensity level. Sound level of the unknown sound.

$$L - L_0 = 10 \log \left(\frac{I}{I_0} \right) (\text{dB})$$

(iv) How can depth of sea be measured by ultrasonic?

Ultrasound is used to locate under water depths or is used for locating objects lying deep on the ocean floor etc. The technique is called SONAR.

The sound waves are sent from a transmitter, and receiver collects the reflected sound. The time lapse is calculated, knowing the speed of sound in water, the distance of the object from the ocean surface can ^{be} estimated.

(v) What is decibel scale?

Decibel scale:-

The decibel scale is a logarithmic measure of the amplitude of sound waves.

(Vi) Is there any difference between echo and reflection of sound? Explain.
When a sound is incident on the surface of a medium it bounces back into the first medium. This phenomenon is called echo or reflection of sound. There is no difference between echo and reflection of sound.

(Vii) What is speed of sound through Brass and Iron at 25°C ?
Speed of sound at 25°C through brass is 4700ms^{-1} and through iron is 5950ms^{-1} .

(Viii) What is the difference between frequency and pitch?

Frequency :-

Frequency is the number of waves passing through a point in one second.

Pitch :-

Pitch is characteristic of sound due to which we can distinguish between shrill and grave sound.

Question : 4

Write short answers to any

Five questions:

(i) Why is Ultrasound useful in medical field?

Ultrasound is useful in medical field because it carries more energy and higher frequency, ($V = f\lambda$) with very small wavelengths than audible sound waves.

(ii) On which factors does the loudness of sound depend?

Loudness of sound depends upon the following factors.

- 1- The amplitude of the vibrating body
- 2- Area of vibrating body
- 3- Distance from vibrating body.

(iii) What is musical sound?

Musical Sounds:-

Such sounds which has pleasant effect on our ears are called musical sounds.

(iv) What is noise?

Noise :-

The sounds with jarring effect on our ears are called noise.

(v) Define Acoustic protection.

Acoustic Protection :-

The technique or method used to absorb undesirable sound energy by soft and porous surfaces is called acoustic protection.

(vi) Define audible frequency range.

Audible Frequency Range :-

The range of the frequencies which a human ear can hear is called the audible frequency range.

(vii) What is the audible frequency range for human ear?

A normal human ear can hear sound only if its frequency lies between 20 Hz and $20,000\text{ Hz}$. A human ear can oscillate back and forth up to $20,000$ times in one second.

(viii) Will two separate 50 dB sounds together constitute a 100 dB sound? Explain.

Since dB is the unit of sound level and its value depend upon the log of intensities, therefore 50 dB sound from two bodies does not constitute 100 dB sound. Each 10 dB increase in sound makes the sound 10-times louder.

(PART - II)

Attempt any two questions.

Question: 5(a)

Explain reflection of sound.

Reflection of Sound:-

When sound is incident on the surface of a medium, it bounces back into the first medium. This phenomenon is called echo or reflection of sound.

Example:-

When we clap or shout near a ^{reflecting} surface such as tall building or a mountain, we hear the same sound again a little later. This sound which we hear

is called an echo and is a result of reflection of sound from the surface.

Explanation :-

The sensation of sound persists in our brain for about 0.1s . If to hear a clear echo the time interval between our sound and the reflected sound must be at least 0.1s . If we consider speed of sound to be 340ms^{-1} at a normal temperature in air, we will hear the echo after 0.1s . The total distance covered by the sound from the point of generation to the reflecting surface and back should be at least $340 \times 0.1 = 34.0\text{m}$. Thus, for hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be half of this distance, that is, 17m . Echoes may be heard more than once due to successive or multiple reflections.

Question : 5 (b)

Calculate the wavelength

of sound produced by tuning fork of frequency 512 Hz . Whereas the speed of sound in air is 140 ms^{-1} .

Given Data:

$$\text{Frequency } (f) = 512\text{ Hz}$$

$$\text{Speed of sound } (v) = 140\text{ ms}^{-1}$$

$$\text{Wavelength of sound } (\lambda) = ?$$

Solution:

We know that

$$v = f\lambda$$

$$\frac{v}{f} = \lambda$$

$$\Rightarrow \lambda = \frac{v}{f}$$

putting given values

$$\lambda = \frac{140}{512}$$

$$\lambda = 0.273\text{ m}$$

Ans.

Question: 6(a)

What do you understand by the longitudinal wave? Describe the longitudinal nature of sound waves.

Longitudinal Waves :-

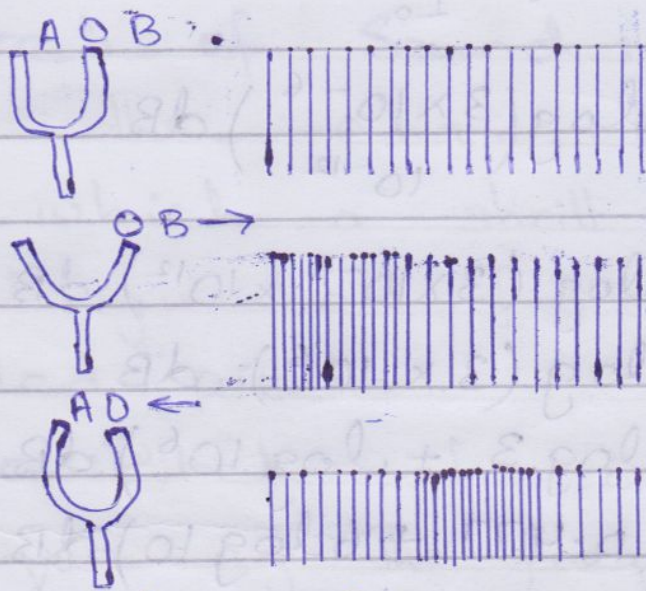
"In longitudinal waves the particles of the medium vibrate parallel to the direction of propagation of wave." e.g. Sound waves

Nature of Sound :-

Sound waves are compressional in nature which can be explained by following experiment.

When we strike the tuning fork on rubber pad its prongs will begin to move between position AOB. When prongs move from O to B, they exert pressure on the adjacent layer of air and compression is produced. The compressed layer of air is 'decreased' compress the layer of air next to it and so on. When prongs move from B to A, the pressure on layer of air is decreased and rarefaction is produced. This rarefaction is transferred to the air layer next to it and so on. So when the tuning fork moves back and forth rapidly, a series of compression

and rarefaction is produced due to which sound waves propagate through air. As the direction of sound wave is along the direction of oscillating air molecules, it shows that sound waves are compressional in nature.



Vibration of tuning fork after striking with a rubber hammer.

Wave length :-

Distance between two consecutive compressions or rarefactions is the wavelength of sound waves. It is denoted by λ .

Question : 6(b)

A normal conversation involves sound intensities of about $3.0 \times 10^{-6} \text{ Wm}^{-2}$. What is the decibel level for this intensity?

Given Data:

Intensities of sound = $I = 3 \times 10^{-6} \text{ Wm}^{-2}$

Threshold intensity = $I_0 = 10^{-12} \text{ Wm}^{-2}$

Decibel intensity = $L - I_0 = ?$

Solution:

We know that

$$L - I_0 = 10 \log \frac{I}{I_0} \text{ dB}$$

$$= 10 \log \left(\frac{3 \times 10^{-6}}{10^{-12}} \right) \text{ dB}$$

$$= 10 \log (3 \times 10^{-6} \times 10^{12}) \text{ dB}$$

$$= 10 \log (3 \times 10^6) \text{ dB}$$

$$= 10 (\log 3 + \log 10^6) \text{ dB}$$

$$= 10 (0.477 + 6 \log 10) \text{ dB}$$

$$= 10 (0.477 + 6) \text{ dB}$$

$$= 10 \times 6.477$$

$$= 64.77 \text{ dB}$$

$$\boxed{L - I_0 = 64.8 \text{ dB}}$$

Ans.

Question : 7(a)

Explain the characteristics of sound.

Characteristics Of Sound:

1- Loudness of Sound :-

The characteristic of sound through which a loud and a faint

sound can be distinguished is called loudness.

The loudness of sound depends upon.

- (a) The amplitude of the vibrating body.
- (b) Area of vibrating body.
- (c) Distance from vibrating body.

2- Pitch of Sound :-

The characteristic of sound by which a shrill sound can be distinguished from a grave sound is called pitch.

Factors: Pitch of sound depends upon frequency. The frequency of the voice of ladies and babies is greater than that of men. Hence, their voice is shrill and of high pitch.

3- Quality of Sound :-

The characteristic of sound by which two sounds of same loudness and pitch are distinguished from each other is called quality of sound.

Example :-

If in a room a note of given loudness and pitch is sounded on a

flute and also on a piano, we can distinguish between them by standing even outside the room, because quality of these notes is different.

4. Intensity of Sound :-

Sound energy flowing per second through a unit area held perpendicular to the direction of sound wave is called intensity of sound.

Unit :-

Its unit is watt per square meter Wm^{-2} . It is a physical quantity and can be measured accurately.

Question : 7(b)

A sound wave has a frequency of 2kHz and wavelength 35cm. How long will it take to travel 1.5km?

Given Data:

$$\begin{aligned}\text{Frequency} = f &= 2\text{kHz} \\ &= 2 \times 1000\text{Hz}\end{aligned}$$

$$= 2000\text{Hz}$$

$$\text{Wavelength} = \lambda = 35\text{cm}$$

$$= \frac{35}{100} \text{ m}$$

$$= 0.35 \text{ m}$$

$$\text{Distance} = S = 1.5 \text{ km}$$

$$= 1.5 \times 1000 \text{ m}$$

$$= 1500 \text{ m}$$

$$\text{Time} = t = ?$$

Solution :

We know that

$$v = f \lambda$$

$$= 2000 \times 0.35$$

$$= 2000 \times \frac{35}{100}$$

$$= 20 \times 35$$

$$= 700 \text{ ms}^{-1}$$

We also know that

$$S = v \times t$$

$$1500 = 700 \times t$$

$$t = \frac{1500}{700}$$

$$t = 2.1 \text{ s}$$

Ans.