

Sound

EXERCISE [PAGE 109]

Exercise | Q 1.1 | Page 109

Fill in the blanks with appropriate word:

The region in a sound wave, with higher pressure and density is called _____ and that with low pressure and density is called _____.

Solution: The region in a sound wave, with higher pressure and density is called **compression** and that with low pressure and density is called **rarefaction**.

Exercise | Q 1.2 | Page 109

Fill in the blanks with appropriate word:

Medium is _____ for generation of sound.

Solution: Medium is **required** for generation of sound.

Exercise | Q 1.3 | Page 109

Fill in the blanks with appropriate word:

The total number of compressions and rarefactions produced per second in a sound wave is 1000. The frequency of the sound wave is _____.

Solution: The total number of compressions and rarefactions produced per second in a sound wave is 1000. The frequency of the sound wave is **500 Hz (One compression and rarefaction together makes a cycle of sound wave)**.

Exercise | Q 1.4 | Page 109

Fill in the blanks with appropriate word:

Different sound notes have different _____.

Solution: Different sound notes have different **frequencies**.

Exercise | Q 1.5 | Page 109

Fill in the blanks with appropriate word:

In loudspeaker _____ energy is converted into _____ energy.

Solution: In loudspeaker **electrical** energy is converted into **sound** energy.



Exercise | Q 2.1 | Page 109

Give scientific reasons:

It is essential to change the tension on the vocal cords, as we produce different sound notes from our larynx.

Solution: Different sound is produced when frequency of vibration of the source of sound is changed. In humans, vocal cords in larynx vibrate and produce sound. Now, the frequency of vibration of vocal cords is directly dependent on the tension produced on it. The higher the tension on the chords, the shriller will be the voice produced. So, we can say that it is essential to change the tension on the vocal cords to produce different sound notes from our larynx.

Exercise | Q 2.2 | Page 109

Give scientific reasons:

Astronauts on the moon can not hear each other directly.

Solution: Sound requires medium to travel. The absence of atmosphere on the Moon makes it medium less. Thus, the astronauts on the Moon cannot hear each other directly because of absence of the medium.

Exercise | Q 2.3 | Page 109

Give scientific reasons:

As the sound wave propagates from one place to the other in air, the air itself is not required to move from one place to the other.

Solution: A vibrating object disturbs the air particles near it. The air particles get compressed as well as start vibrating and gain energy. These particles, vibrating about their mean position, then transfer their energy to the other layer of particles near to them. In this way, region of compression and rarefaction are created and hence sound is produced. So, in sound production, only the transfer of energy of the vibrating particles takes place and not the transfer of particles themselves. So, yes we can say that as the sound wave propagates from one place to the other in air, the air itself is not required to move from one place to the other.

Exercise | Q 3 | Page 109



How are different sound notes generated in musical instruments like guitar, which uses strings for sound generation, and flute, which uses blown air for sound generation ?

Solution:

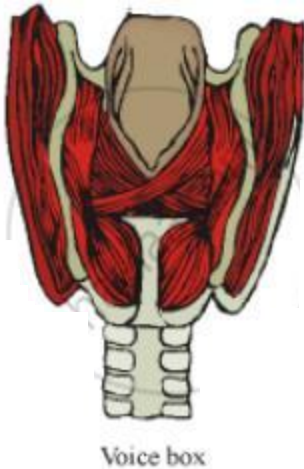
- **In stringed instruments (like guitar):** Different notes are generated in these instruments when the frequency of vibration of string is changed. It can be changed by changing the
 - **tension in string:** If the string of the instrument is under high tension, then the pitch of the note produced on plucking the string will be high i.e. the note will be shriller because frequency of vibration of the string will be high.
 - **thickness of string:** If the string of the instrument is thin, then the pitch of the note produced on plucking the string will be high as frequency of vibration of the string will be high.
 - **position of plucking of string:** If a string stretched between two fixed ends is plucked closer to one of the fixed ends, then the pitch of the sound note produced will be high.
- **In wind instruments (like flute):** Different notes are produced in these instruments by varying the length of the air column in them. The length of the air column can be increased or decreased by closing or opening the more number of holes present in these instruments.

Exercise | Q 4 | Page 109

How is sound produced in a human larynx and a loudspeaker?

Solution: Production of sound in humans

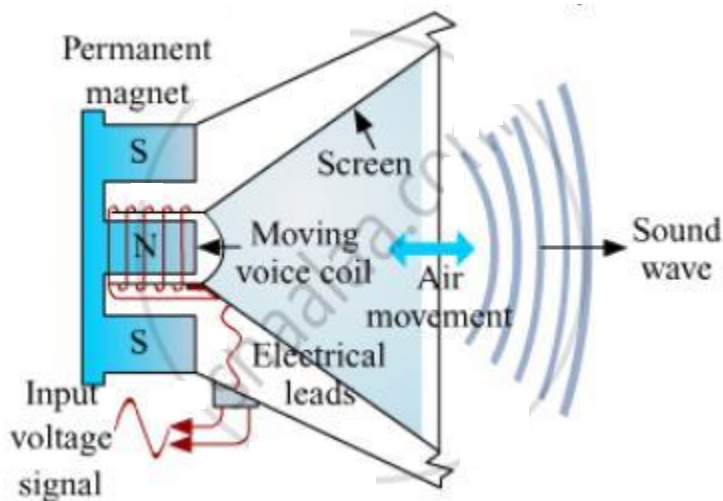
The larynx (voice box) is responsible for producing sounds in humans. It consists of two vocal cords. These cords are arranged in such a manner that there is a small gap between them. This small gap allows air to pass through. When we speak, air is forced into this small gap by the lungs. This prompts our vocal cords to vibrate and hence, produce sounds.



Production of sound in loudspeaker

A loudspeaker consists of following parts:

- An electric coil wound on a permanent magnet.
- A conical shaped screen of the speaker connected to the coil.



Now, when variable current flows through the coil, magnetic field is produced around it due to electromagnetism and it behaves like an electromagnet. Because of this, the coil is repelled and attracted by the permanent magnet alternately. The screen attached to the coil moves back and forth due to the attraction and repulsion of the coil and hence, produces sound.

Exercise | Q 5 | Page 109

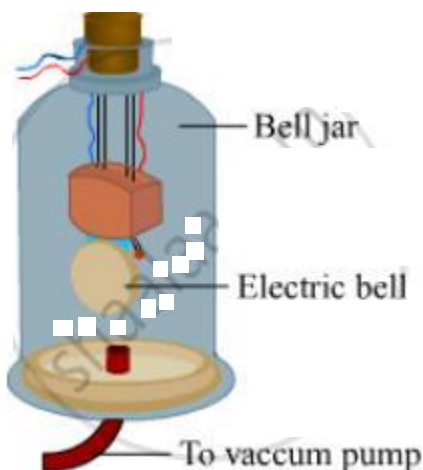
Explain the experiment, with neat diagram, to prove the following:

'Sound needs material medium for propagation.'

Solution: Bell jar experiment can prove that sound needs material medium for its propagation.

Construction

- A bell jar
- A vacuum pump connected to the jar through a tube
- An electric bell inside the jar and is connected to the electric supply through the lid of the bell jar



Working

Initially the vacuum pump is 'OFF' so that air is present inside the jar. Now, if electric supply is switched on, the electric bell will start ringing and this ringing can be heard outside the bell jar.

Now, switch on the vacuum pump such that it starts sucking the air inside the jar. It will be observed that, with the decrease in quantity of air inside the jar, the level of ringing sound heard outside also decreases. If the pump is used for sufficiently long period, then the quantity of air inside the jar will be so low that the ringing sound outside it will not be audible. This proves that sound requires medium for its propagation.

Exercise | Q 6 | Page 109

Match the following

Human larynx	Vibrations of metal arms
Loudspeaker	Vibrations in air column
Jal-tarang	Vibrations in vocal cords
Tuning fork	Vibrations in strings
Sitar	Vibrations of screen

Solution:



Human larynx	Vibraions in vocal cords
Loudspeaker	Vibrations of screen
Jal-tarang	Vibrations in air column
Tuning fork	Vibrations of metal arms
Sitar	Vibrations in strings

