

**Chapter: 15**

**Q.1 Fill in the blank and rewrite the completed statements**

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1 In loudspeaker, ..... energy is converted into ..... energy.

**Ans** In loudspeaker, **electrical** energy is converted into **sound** energy.

2 The total number of compressions and rarefactions produced per second in a sound wave is 500Hz. The frequency of the sound wave is .....

**Ans** The total number of compressions and rarefactions produced per second in a sound wave is 500 Hz. The frequency of the sound wave is **500 Hz**.

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

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

4 Different sound notes have different .....

**Ans** Different sound notes have different **frequencies**.

5 Medium is ..... for generation of sound.

**Ans** Medium is **necessary** for generation of sound.

**Q.2 Match the pair**

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1	Column - A	Column - B
	i. Human larynx	a. Vibrations of screen
	ii. Loudspeaker	b. Vibrations in air column
		c. Vibrations in vocal cords

<b>Ans</b>	i. Human larynx	Vibrations in vocal cords
	ii. Loudspeaker	Vibrations of screen

**Q.3 Give scientific reasons**

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1 Astronauts on the moon can not hear each other directly.

**Ans** i. Sound requires a material medium for its propagation.  
ii. The moon does not have atmosphere. Since there is no medium between the astronauts on the moon, direct sound propagation between them is not possible.  
Hence, astronauts on the moon cannot hear each other directly.

2 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?

**Ans** i. Musical instruments like guitar use strings for producing sound. In such string based instruments, the frequency of vibration of the string is changed by changing the tension on the string and/or by changing the vibrating length of the string. This results in generation of different notes.  
ii. In musical instruments like flute, the holes on the flute are opened or closed to change the length of vibrating air column in the flute. The frequency of waves, therefore, changes and it results in the production of different notes. Also, by changing the way air is blown, different notes can be generated.

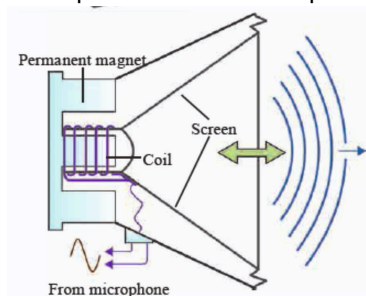
**3** How is sound produced in a human larynx and a loudspeaker?

**Ans a. Sound production in humans:**

- In humans, sound is produced in the larynx (voice box) situated at the upper end of the windpipe.
- Two vocal cord are stretched across the larynx leaving a narrow slit between them for the passage of air.
- When the lungs force air through the slit, the vocal cords vibrate, producing sound.
- Muscles attached to the vocal cords can make the cords tight or loose. When the vocal cords are tight and thin and thin, the type or quality of sound produced is different than the sound produced when vocal cords are loose and thick.

**b. Sound production in loudspeaker:**

- Loudspeaker consists of a permanent magnet with a coil wound around it.



- When current flows through the coil, magnetic field is generated around the coil.
- Due to this magnetic field, the coil moves back and forth.
- The frequency and amplitude of the movement of the coil depends on the variation in the current flowing through the coil.
- Due to the motion of the coil, the conical screen attached to the coil also starts moving back and forth.
- This back and forth movement of loudspeaker screen gives rise to sound waves in air.

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

- Ans**
- In humans, sound is produced in the larynx (voice box) situated at the upper end of the windpipe.
  - Two vocal cords are stretched across larynx leaving a narrow slit between them for the passage of air.
  - When the lungs force air through the slit, the vocal cords vibrate, producing sound.
  - Frequency of the sound generated depends upon the tension of the vocal cords which are controlled by muscles in the larynx.
- Hence, it is essential to change the tension of the vocal cords, as we produce different sound notes from our larynx.

**5** 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.

- Ans**
- A sound wave propagates in the form of compression and rarefaction.
  - When a compression is formed, compressed air molecules in next region without leaving their positions.
  - As a result, air molecules in next region get compressed and transfer energy further in the same manner.
  - Meanwhile, a rarefaction gets formed and moves forward in the similar way.
  - As a combined effect, air molecules propagate sound waves without actual movement.
- Hence, during propagation of sound wave in air from one place to another, air itself is not required to move.

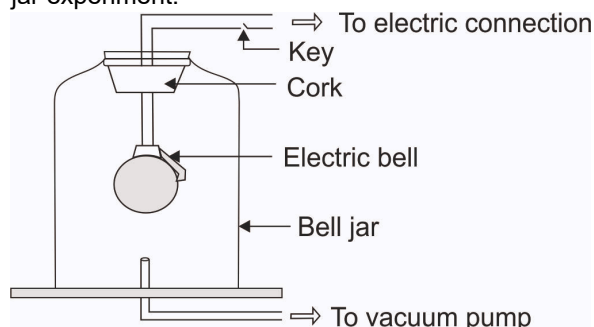
**Q.4** Answer the following in detail

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

‘Sound needs material medium for propagation.’

- Ans** **Aim:** To verify that a material medium is essential for the propagation of sound waves with the help of the bell jar experiment.



**Procedure:**

- i. Take an inverted glass jar and place it on a smooth surface. Using a tube, connect the jar to a vacuum pump. Fit an electric bell in the jar as shown in the figure given above.
- ii. At the beginning of the experiment, the vacuum pump is switched off and the bell-jar contains air. Now switch on the key to electric bell. The bell starts ringing and the ringing can be heard outside the bell jar.
- iii. Take the air out of the glass jar with the help of a vacuum pump.

**Observation:**

- i. when air is steadily taken out of the glass jar, the sound of the bell goes on decreasing and after a certain time the sound becomes inaudible. However, vibrations of gong of the bell can be seen from outside.

**Conclusions:**

- i. A material medium is required for the propagation of sound waves.
- ii. Sound cannot travel in vacuum.

