Q. 1 What do you mean by a vibratory motion ?

Answer:

The oscillatory motion in which the body assumes a new shape during its motion, is called the vibratory motion.

Q. 2 What is sound ?

Answer:

Sound is a form of energy which produces the sensation of hearing.

Q.3 How is sound produced ?

Answer:

Sound is produced by vibrating bodies.

Q. 4 Describe an experiment to show that each source of sound is a vibrating body.
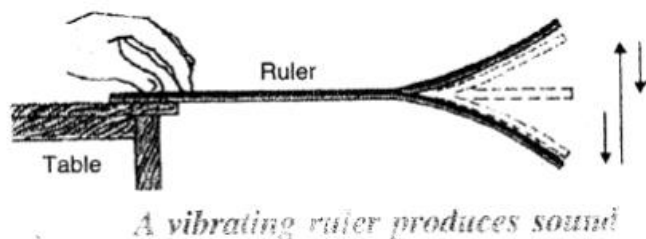
Answer:

Sound is produced when a body vibrates. In other words, each source of sound is a vibrating body. This can be demonstrated by the following experiment.

Take a ruler. Press its one end on the table with the left hand as shown in figure. Pull down the other end of the ruler with the right hand and then leave it.

You will notice that the ruler vibrates i.e., the ruler moves to and fro and a humming sound is heard. After some time, the ruler stops vibrating. No sound is then heard.

A vibrating ruler produces sound

This shows that the humming sound is produced only because of the vibrations of the ruler.
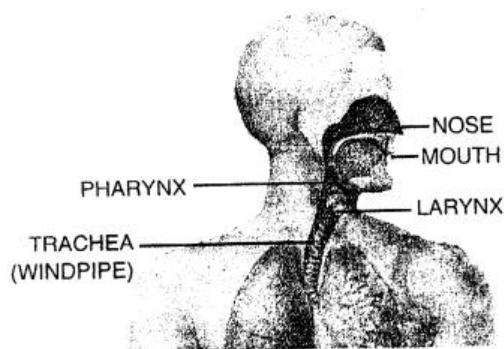
Q.5 Name two sources of sound.

Answer:

Each vibrating body is a source of sound. We, the human beings, produce sound when our vocal cords vibrate on blowing air through them by our lungs. Some animals like birds, frogs etc., also produce sound due to vibration of their vocal cords. But bees do not have the voice-boxes. They produce sound by moving their wings up and down very fast.

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Q. 6 How do we produce sound ?

Answer:

Our throat has a larynx. The voice is produced in the larynx. Larynx is also called the voice box. It is designed to produce voice. It is a box like structure with walls of tough tissues. Inside two folds of the tissue, there is a gap. They are the vocal cords. When we breathe, the vocal cords become loose and the gap between them increases. When we talk, shout or sing, the cords become tight and hence they vibrate, thus produce sound. Given figure shows the part of the body which vibrates to produce sound.

Parts of the human body which vibrate to produce sound

Q. 7 The bees do not have voice-boxes. How do they produce sound ?
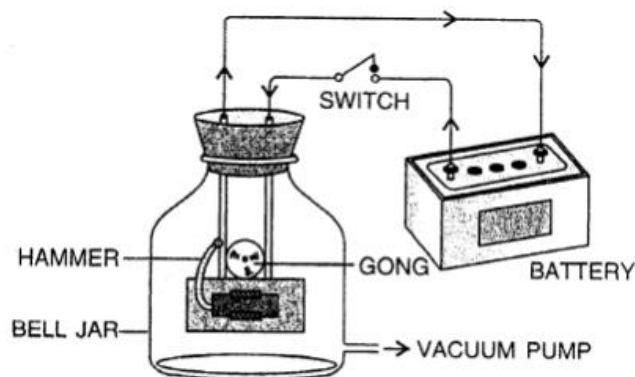
Answer:

The bees do not have the voice-boxes. Still they produce sound.

This happens by the vibrations produced by the quick movement of their wings. Bees buzz while flying and depositing pollen among flowers.

Q. 8 Can sound travel through a vacuum ? Describe an experiment to explain your answer.

Answer:

Experiment — Arrange an electric bell, a glass bell jar, a vacuum pump, a battery and a switch as shown in the figure. When the circuit is closed by pressing the switch, the bell starts ringing and sound can be heard. Now remove the air from the jar with the help of vacuum pump. The loudness of the sound gradually decreases and a stage comes when no sound is heard. Sound requires a medium to travel but cannot travel in vacuum.

Sounds needs a medium for propagation

Connect the bell to a battery through a switch. On pressing the switch, the bell starts ringing and a sound is heard. The sound reaches us through the air in the jar.

Now start the vacuum pump. It withdraws the air from the jar. You will notice that as the jar is evacuated, the sound becomes feeble and feeble. After some time when no air is left within the jar, no sound is heard. However, the hammer of the electric bell can be still seen striking the gong. The reason is that when no air is left in the jar, the sound does not reach us, although the bell is still ringing (or vibrating).

Thus, sound cannot travel through a vacuum.

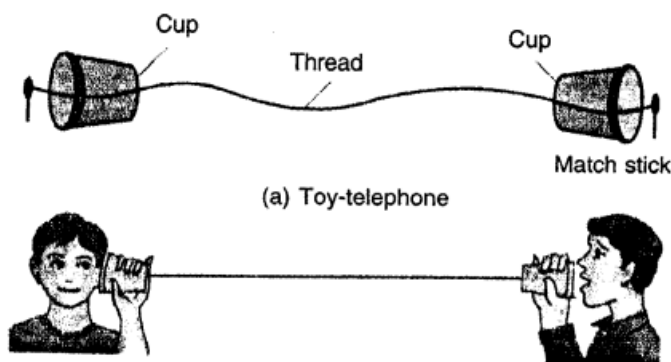**Q. 9** Describe an experiment to show that sound can travel in water.

Answer:

Take a tub filled with water. Hold a bell in one hand and dip it in water. Keep one of your ears gently on the surface of water without letting water into the ear. Now ring the bell inside water. You will be able to hear the sound clearly. This shows that sound can travel through liquids.

Q. 10 Describe an experiment to show that sound can travel in a solid.

Answer:

Take two empty ice-cream cups. Make a small hole at the bottom of each cup and pass a long thread (about 20 m long) through them. Tie a knot or match-stick at each end of the thread so that the thread does not slip out through the holes. This makes a toy – telephone

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(a) Toy-telephone

Sound travels in a solid

Now use the toy-telephone as shown in figure and talk to your friend. You will be able to hear the sound of your friend. This shows that sound travels through the thread and reaches your ear. Thus, sound can travel through a solid.

Q. 11 Can two person hear each other on moon's surface ? Give reason to support your answer.

Answer:

No, we cannot hear each other since sound requires medium for transmission. It cannot travel through vacuum.
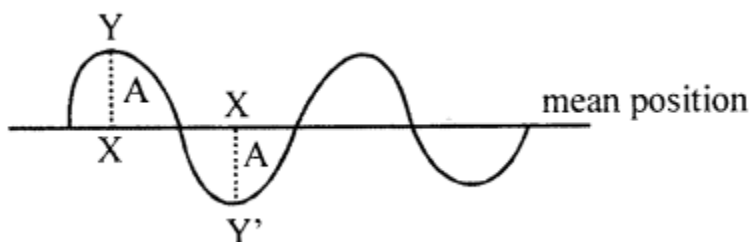
Q. 12 What is a longitudinal wave ?

Answer:

In a longitudinal wave, the particles of air vibrate to and fro about their mean positions in the direction of travel of sound.
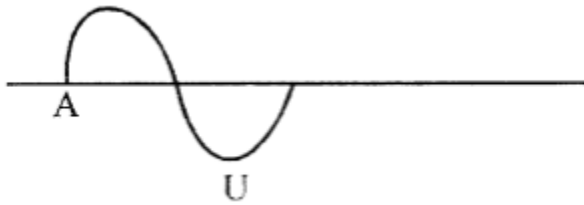
Q. 13 Define the following terms :

Amplitude, Time period, Frequency.

Answer:

(a) **Amplitude (A) :** The maximum displacement of a wave on either side of its mean position is called Amplitude. A = XY is amplitude.

(b) **Time Period (T) :** Time taken to complete one vibration is called Time Period, i.e. from A to B

(c) Frequency (f) or u

Number of oscillations made by a wave in one second is known as its frequency.

Q.14 Write the audible range of frequency for the normal human ear.

Answer:

The range of frequency from 20 Hz to 20,000 Hz is called the audible range for the normal human ear.

Q. 15 What are ultrasonics ? Can you hear the ultrasonic sound ?

Answer:

Sounds of frequency higher than 20,000 Hz are called the ultrasonics. We cannot hear the ultrasonic sounds.

Q. 16 What are infrasonics ? Can you hear them ?

Answer:

Sounds of frequency lower than 20 Hz are called the infrasonics. We cannot hear the infrasonic sounds.

Q.17 How does a bat make use of ultrasonics waves to find its way?

Answer:

Use of ultrasonics by bats : Bats have no eyes. But they easily move about without colliding with any object (or obstacle). The reason is that they produce ultrasonic sound as they fly. When this ultrasonic sound comes back after reflection from any object (or obstacle) in their way, they hear it and thus they detect the presence of the object (or obstacle).

Q. 18 Name the two characteristics of sound which differentiate two sounds from each other.

Answer:

A sound wave is characterized by its amplitude and frequency. Depending upon the (amplitude and frequency of the sound wave, the following two characteristics of sound :

(1) Loudness, and (2) Pitch.

Q. 19 On what factor does the loudness of a sound depend ?

Answer:

The loudness of a sound depends on the amplitude of vibration of the vibrating body producing the sound.

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Q.20 The outer case of the bell in a temple is made big. Give a reason.

Answer:

The outer case of the bell in a temple is made big. So that there is multiple reflection of sound and the sound can be amplified.

Q.21 State the factors on which the pitch of a sound depends.

Answer:

The pitch of a sound depends on its frequency (i.c., on the frequency of the vibrating body).

Q.22 How does a man's voice differ from a woman's voice ?

Answer:

A female voice is shriller than a male voice because of higher frequency. Higher is the frequency, shriller is the sound. Female has higher frequency.

Q. 23 Name the characteristic which differentiates two sounds of the same pitch and same loudness.

Answer:

The quality is the characteristic of sound which distinguishes the two sounds of the same pitch and same loudness.

Q.24 How can the pitch of sound produced in a piano be changed ?

Answer:

In a piano, the string is struck to make the string vibrate and produce sound. The pitch of sound produced can be changed by stretching or loosening the strings of piano.

Q.25 Write the approximate speed of sound in (i) air, (ii) water and (iii) steel.

Answer:

Medium	Speed of sound
(i) **Gas**	
Air	330 m s^{-1}
(ii) **Liquid**	
Water	1500 m s^{-1}
(iii) **Solid**	
Iron or Steel	5000 m s^{-1}

Q.26 During a thunderstorm, the sound of a thunder is heard after the lightning is seen. Why ?

Answer:

The velocity of light is 3×10^8 m/s whereas velocity of sound is 332 m/s. First we see the flash of light and then we hear the thunder.

Q.27 What do you mean by reflection of sound ?

Answer:

Reflection of Sound— When a sound wave strikes a rigid surface, it retraces from its path is called reflection of sound.

Q.28 State one use of reflection of sound.

Answer:

The reflection of sound is used in making the speaking tube (or megaphone), sound board and trumpet.

Q.29 What is echo ?

Answer:

Echo is the sound heard after reflection from a rigid surface such as a cliff, a hillside, the wall of a building etc.

Q.30 What minimum distance is required between the source of sound and the reflecting surface to hear an echo? Give reason.

Answer:

Since sound has to travel an equal distance in going up to the reflecting surface and in coming back from the reflecting surface, therefore it must travel nearly 33/2 = 16.5 m either way. Thus, to hear the echo clearly in air, the reflecting surface should be at a minimum distance of 16.5 m from the source of sound.

Numericals

Q 1. A boy fires a gun and another boy at a distance of 1020 m hears the sound of firing the gun 3 s after seeing its smoke. Find the speed of sound.

Answer:

$$\text{Speed} = \frac{\text{Distance travelled}}{\text{time taken}}$$

$$\text{Speed} = \frac{1020}{3} = 340 \text{ m s}^{-1}$$

Question 2. A boy on a hill A fires a gun. The other boy on hill B hears the sound after 4 s. If the speed of sound is 330 m s-1, find the distance between the two hills.

Answer:

Speed, v = 330 m s^{-1}

t = 4s

Distances = v × t

= 330 × 4s = 1320 m