

# 11 Sound

## 11.1 Production of sound

We hear various sounds frequently in our day-to-day life. Sounds of birds, sounds of radio and television are some of them. Let us do Activity 11.1 to find out more about the sounds we hear.

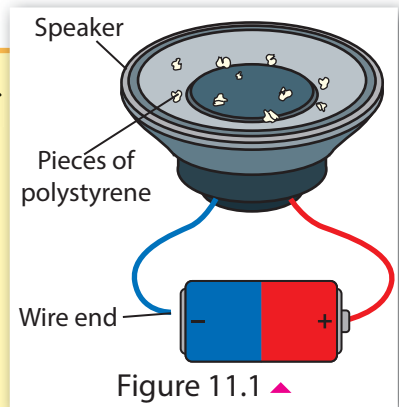


### Activity 11.1

**You will need :-** A speaker, some pieces of polystyrene, connecting wire, dry cells

**Method:-**

- Connect the wires to the terminals of the speaker. Place the pieces of polystyrene on the speaker.
- Connect one of the two free ends of wires to the dry cell.
- Touch the other free end of the wires with the other terminal of the dry cell and remove at once. (Do not keep the wires connected to the dry cell)
- Keep on touching and removing one end of the wires to the dry cell and record your observations.



It is observed that pieces of polystyrene are thrown up, only when the speaker is connected to the dry cell.

It means that pieces of polystyrene are thrown up, only when the speaker produces sound. This happens because of the to and fro movement of the speaker cone. This type of a speedy to and fro movement is known as **vibration**.

It is clear that sound is generated due to the vibration of an object.

Let us do Activity 11.2 to find out more about the generation of sound.



### Activity 11.2

**You will need :-** A tuning fork, a laboratory stand, a piece of thread, a small polystyrene ball

**Method:-**

- Hang the small polystyrene ball (using a piece of thread), as shown in the figure.
- Vibrate the tuning fork and bring it close to the polystyrene ball.
- Observe what happens. (Repeat this several times.)

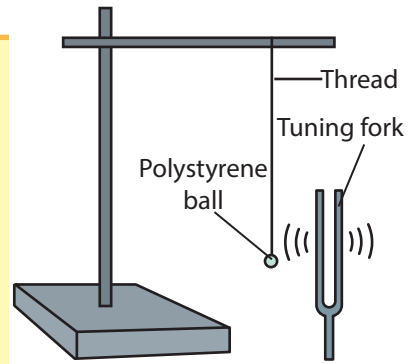


Figure 11.2 ▲

It is observed that the polystyrene ball moves towards the vibrated tuning fork, when it is brought closer. The polystyrene ball moves only when there are vibrations in the tuning fork.

Let us do Activity 11.3 to find out how our vocal sound is produced.



### Activity 11.3

**Method :-**

- Place your fingers on the middle of your throat, as shown in the figure.
- Speak slowly and record what your finger feels.
- Speak louder and record the feeling to your fingers.



Figure 11.3 ▲

A light trembling is felt to the fingers when speaking slowly. This trembling increases when the voice is increased. This type of trembling is felt because of the vibration of membranes in the throat which are known as vocal cords. That means, our vocal sound is produced because of the vibration of vocal cords in the throat.



## Assignment 11.1

- Design and carry out simple activities to show that sound is produced by vibrations.

## Instruments that produce sound



### Activity 11.4

**You will need :-** A guitar, a drum, a flute, a tabla

**Method :-**

- Produce sound using the sources of sound that you are provided with.
- Observe the part of sound source that vibrates when sound is produced.
- Tabulate your findings.



Figure 11.4 ▲

Compare your observations and findings with Table 11.1.

Table 11.1 ▼

Sound source/ Instrument	Part that vibrates
Guitar	Strings
Drum	Membranes
Flute	Air
Tabla	Membranes

Accordingly, it can be concluded that various musical instruments produce sound in various ways. Musical instruments can be categorized according to the part that vibrates to produce sound.



### Assignment 11.2

- Listen carefully to some natural and artificial sounds heard in the environment and list them out. Tabulate them as given below, with the part that vibrates when producing sound. (method of producing sound)

Sounds heard	Part that vibrates
School bell	



### Assignment 11.3

- Make a list of musical instruments commonly used. Mention the method of producing sound in each listed instrument.



### Assignment 11.4

- You may have heard of the sounds of some animals like mosquitoes, crickets and honey bees. Find out and record how they produce those sounds.

## 11.2 Propagation of sound

In classroom, you hear the voice of your teacher. In the space, two astronauts cannot hear each other's voice despite being closer to each other. What is the reason for this?

Let us do Activity 11.5 to find about it.



Figure 11.8 ▲ Astronauts



### Activity 11.5

**You will need :-** A bell jar, a vacuum pump, an electric bell, few dry cells, connecting wire, a switch

**Method :-**

- Fix the electric bell in the bell jar as shown in the figure. Connect it to dry cells and to a switch to supply electricity.
- Connect a vacuum pump to the bell jar so that the jar can be evacuated.
- First, switch on the electric bell and record your observations.
- Then switch on the electric bell again while evacuating the air in the bell jar using the vacuum pump. Record your observations.

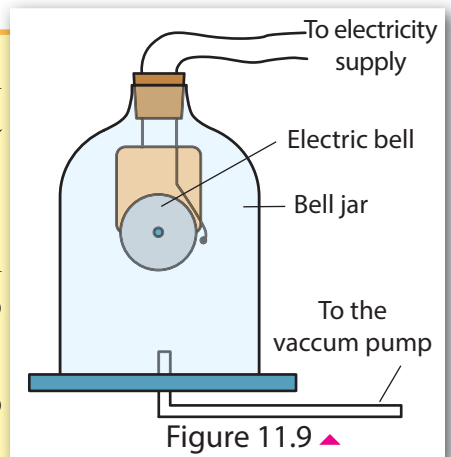


Figure 11.9 ▲

- Finally switch on the electric bell again when the bell jar is completely evacuated.
- Record your observations.

Ring of the electric bell can be heard, when the bell jar is filled with air. When the air in the bell jar is gradually evacuating, the ringing of the bell gradually fades. When the air in the bell jar is completely evacuated, ringing completely fades off.

It is clear that ringing of the bell is heard only when there is air in the bell jar. Sound is not heard in a space where there is no air (in a vacuum). Thus, it is clear that a medium is essential for sound to propagate.

We hear the voice of the teacher in the classroom, because sound travels through air towards our ears. But two astronauts in the space cannot hear each other because there is no air in the space for sound to travel through. Thus, it is clear that sound does not travel in an empty space and sound needs a medium to travel. Sound which is produced from a sound source, travels from where it is originated know as propagation of sound. We hear different sounds when sound propagate through air to our ears.

Does sound travel only through air? Let us do Activity 11.6 to find out whether sound propagates through liquid and solid medium.



### Activity 11.6

**You will need :-** Three plastic funnels, pieces of rubber tubes, membranes of balloons, a basin, Y tube, water

**Method :-**

- Assemble the equipment as shown in the figure. Hold the funnels A and B on your ears and dip the funnel C in the basin of water.
- Make a sound near the funnel in water.
- Record your observations.

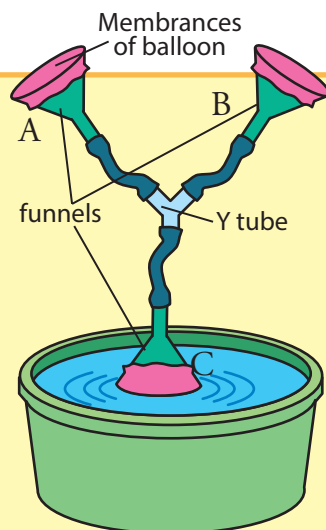


Figure 11.10 ▲



Sound, made in water, can be heard well through funnels A and B. Thus, it is clear that sound travels through liquids like water.

When shallow grounds are flooded, the sound of the vehicles travelling, the nearby roads can be heard louder than other days. The reason for that is sound travels through liquids faster than through air.

Let us do Activity 11.7 to find out whether sound propagates through solid medium.



### Activity 11.7

**You will need :-**

Two empty yoghurt cups, a long thin thread (about 10 m)



Figure 11.11 ▲

**Method :-**

- Connect the bottoms of the two yoghurt cups to the thread as shown in the figure.
- Get the support of one of your friends for this activity and keep one of the yoghurt cups to your ear. Tell your friend to go as far as possible (Keeping the thread well stretched) and speak into the other cup.

You can hear your friend clearly. Thus, it is clear that sound propagates through the thread.

Let us do Activity 11.8 to test whether sound travels through solid medium.



### Activity 11.8

**You will need :-** A clock giving 'tic' sound, a long table



Figure 11.12 ▲

### Method :-

- Keep the clock at one end of the table as shown in the figure.
- Stand at the other end of the table and test whether you can hear the 'tic' sound of the clock through air.
- Then place your ear on the table (as shown in the figure) and listen to the 'tic' sound of the clock.

The 'tic' sound of the clock can be heard through the table more clearly than through the air.

It is clear by the above activities, that sound propagates faster through solid medium than gaseous medium.



### Assignment 11.5

- Plan and do different experiments to show that sound travels through solid and liquid medium.



### For extra knowledge

- Stethoscope is an instrument used by physicians to diagnose patients. It functions in such a way that membrane of it vibrates accordingly to the sounds emitted by the heart, lungs and pulses.
- Sound pipes are used in the past in large buildings, ships and graphite mines to propagate sound to far away places.

The sound of a train coming from far away can be heard clearly when the ear is kept on the rail line. (This is a very risky activity) The reason for this is that sound travels faster through solids than through air.



Figure 11.13 ▲ Dolphins

We can hear the sound emitted by dolphins more intensely when we are in under water. But, the same sound emitted by them above water is heard very lightly. The reason for this is that sound travels faster through water than through air.



The speed of propagation of sound through solid, liquid and gaseous media is different from each other. Sound propagates faster through solids than through liquids and gases. Speed of sound is least in gaseous medium.

Table 11.2 ▼ Speed of sound according to medium

Medium	Speed of sound (Meters per second)
Air (gas)	330
Water (liquid)	1500
Steel (solid)	4500

During lightning, thundering sound and the light emit at the same time. But we hear the sound after few seconds of seeing light. The reason for this is that the speed of sound is slower than that of light.



### For extra knowledge

When a canon is fired, the sound and the emission of smoke occur at the same time. But, a far away observer hears the firing sound after few seconds of seeing the smoke.



### Summary

- Sound is generated due to vibrations.
- Sound can be produced by the vibration of membranes, strings or air.
- A medium is necessary for the propagation of sound.
- The speed of sound is different in different media.
- The speed of sound is faster in solid media than in liquid or gaseous media.

## Exercises

1. Fill in the blanks using the words given below.

(speed, solid, a medium, vibrations, air)

- I. Sound is produced by .....
- II. .... is necessary for the travelling of sound.
- III. Sound travels more faster through ..... medium.
- IV. Sound is produced in a flute by the vibration of .....

2. Select the correct answer.

I. The musical instrument that produces sound by vibrating strings is

- i. Drum
- ii. Violin
- iii. Pair of tabla
- iv. Flute

II. Consider the following statements.

A. Sound travels through a vacuum.

B. The speed of sound in air is higher than the speed of light.

C. A medium is essential for the travelling of sound.

The correct statements out of the above is/are;

- i. A only
- ii. B only
- iii. C only
- iv. A and B only

### Technical Terms

Sound	-	திவனிய	-	லிஓ
Propagation of sounds	-	திவனி ஙதிரேஙனய	-	ஓலியின் கடத்துகை
Vibration	-	கதிரய	-	அதிரவு
Speed of sound	-	ஓநிதயே லேய	-	ஓலியின் கதி
Vacuum	-	ஓனய	-	வெற்றிடம்
Tuning fork	-	ஙரஙுல	-	இசைக்கவர்
Vacuum pump	-	ஓன ஙஓதிரய	-	வெற்றிடப் பம்பி