0652CH15

15 Air Around us

We have learnt in Chapter 9 that all living things require air. But, have you ever seen air? You might not have seen air, but, surely you must have felt its presence in so many ways. You notice it when the leaves of the trees rustle or the clothes hanging on a clothes-line sway. Pages of an open book begin fluttering when the fan is switched on. The moving air makes it possible for you to fly your kite. Do you remember Activity 3 in Chapter 5 in which you separated the sand and sawdust by winnowing? Winnowing is more effective in moving air. You may have noticed that during storms the wind blows at a very high speed. It may even uproot trees and blow off the rooftops.

Have you ever played with a *firki* (Fig. 15.1)?

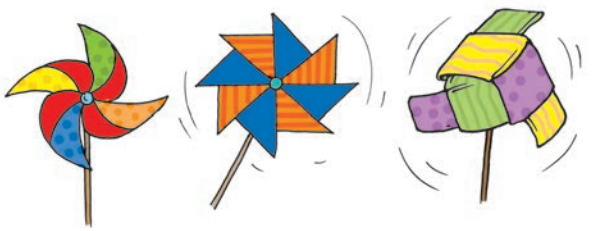


Fig. 15.1 *Different types of firki*

Activity 1

Let us make a *firki* of our own, following the instructions shown in Fig. 15.2.

Hold the stick of the *firki* and place it in different directions in an open area.

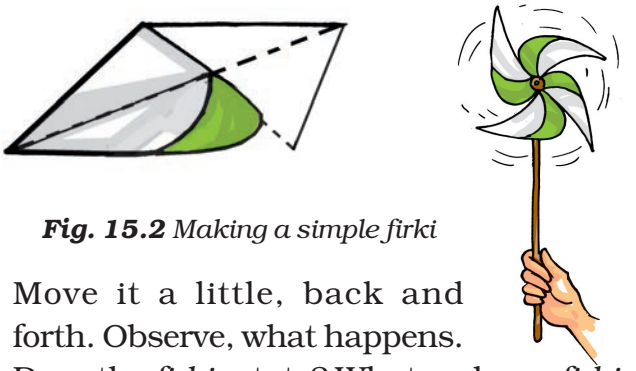


Fig. 15.2 *Making a simple firki*

Move it a little, back and forth. Observe, what happens. Does the *firki* rotate? What makes a *firki* rotate — moving air, isn't it?

Have you seen a weather cock (Fig. 15.3)? It shows the direction in which the air is moving at that place.

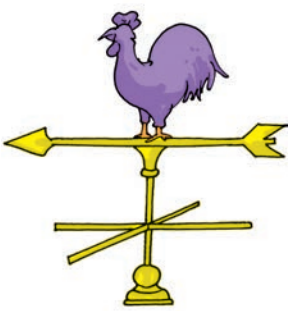


Fig. 15.3 *A weather cock*

15.1 Is Air Present Everywhere Around us?

Close your fist — what do you have in it? Nothing? Try the following activity to find out.

Activity 2

Take an empty open bottle. Is it really empty or does it have something inside? Turn it, upside down. Is something inside it, now?

Fig. 15.4 *Experiments with an empty bottle*

Now, dip the open mouth of the bottle into the bucket filled with water as shown in Fig. 15.4. Observe the bottle. Does water enter the bottle? Now tilt the bottle slightly. Does the water now enter the bottle? Do you see bubbles coming out of the bottle or hear any bubbly sound? Can you now guess what was in the bottle?

Yes! You are right. It is "air", that was present in the bottle. The bottle was not empty at all. In fact, it was filled completely with air even when you turned it upside down. That is why you notice that water does not enter the bottle when it is pushed in an inverted position, as there was no space for air to escape. When the bottle was tilted, the air was able to come out in the form of bubbles, and water filled up the empty space that the air has occupied.

This activity shows that air occupies space. It fills all the space in the bottle. It is present everywhere around us. Air has no colour and one can see through it. It is transparent.

Our earth is surrounded by a thin layer of air. This layer extends up to many kilometres above the surface of the earth and is called atmosphere. As we move higher in the atmosphere, the air gets rarer.

Fig. 15.5 *Mountaineers carry oxygen cylinders with them*

Now can you think, mountaineers carry oxygen cylinders with them, while climbing high mountains (Fig. 15.5)?

15.2 What is Air Made up of?

Until the eighteenth century, people thought that air was just one substance. Experiments have proved that it is really not so. Air is a mixture of many gases. What kind of a mixture is it? Let us find out about some of the major components of this mixture, one by one.

Water vapour

We have learnt earlier that air contains water vapour. We also saw that, when air comes in contact with a cool surface, it condenses and drops of water appear on the cooled surfaces. The presence of water vapour in air is important for the water cycle in nature.

Oxygen

Activity 3

In the presence of your teacher, fix two small candles of the same length on a

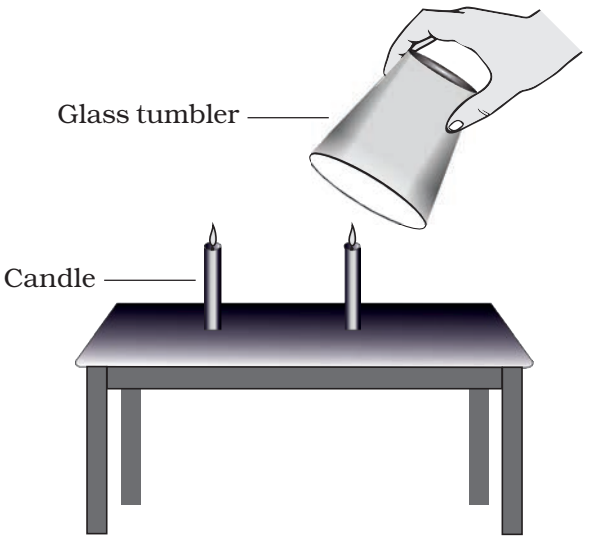


Fig. 15.6 *Air has oxygen*

table. Light both the candles. Cover one of the candles with an inverted glass tumbler. Observe both the candles carefully.

Do both the candles continue to burn or go off?

You must have observed that the candle covered with glass tumbler got extinguished after some time, whereas the other candle continued burning.

What can be the reason for this? Think about it.

It seems that the candle got extinguished because the component inside of the glass tumbler, which supports burning, is limited. Most of the component is used up by the burning candles. However, the other candle is getting continued supply of air. This component of air, which supports burning, is known as oxygen.

Nitrogen

In Activity 3 did you observe that air is still present in the glass bottle even after the candle blew out? This indicates the presence of some component in the air, which does not support burning. The major part of air (which does not support burning candle) is **nitrogen**.

Carbon dioxide

In a closed room, if there is some material that is burning, you may have felt suffocation. This is due to excess of carbon dioxide that may be accumulating in the room, as the burning continues. Carbon dioxide makes up a small component of the air around us. Plants and animals consume oxygen for respiration and produce carbon dioxide. Plant and animal matter also consumes oxygen on burning and produces mainly carbon dioxide and a few other gases. It is advisable not to burn dry leaves and discarded remains of the crop, which pollute our surroundings.

Dust and smoke

The burning of fuel also produces smoke. Smoke contains a few gases and fine dust particles and is often harmful. That is why you see long chimneys in factories. This takes the harmful smoke and gases away from our noses, but, brings it closer to the birds flying up in the sky!

Dust particles are always present in air.

Activity 4

Find a sunny room in your school/ home. Close all the doors and windows with curtains pulled down to make the

Fig. 15.7 *Observing presence of dust in air with sunlight*

Fig.15.8 *Policemen regulating traffic at a crowded crossing often wear a mask*

room dark. Now, open the door or a window facing the sun, just a little, in such a way that it allows sunlight to enter the room only through a slit. Look carefully at the incoming beam of sunlight.

Do you see some tiny shining particles moving in the beam of sunlight (Fig. 15.7)? What are these particles?

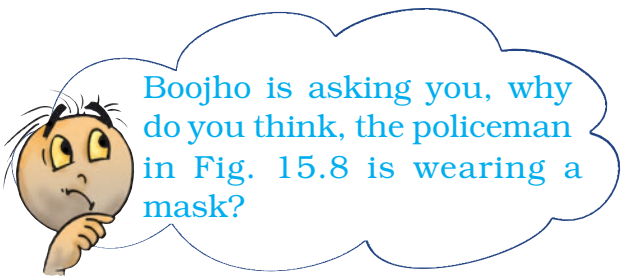
During winters you might have observed similar beam of sunlight filter through the trees in which dust particles appear to dance merrily around!

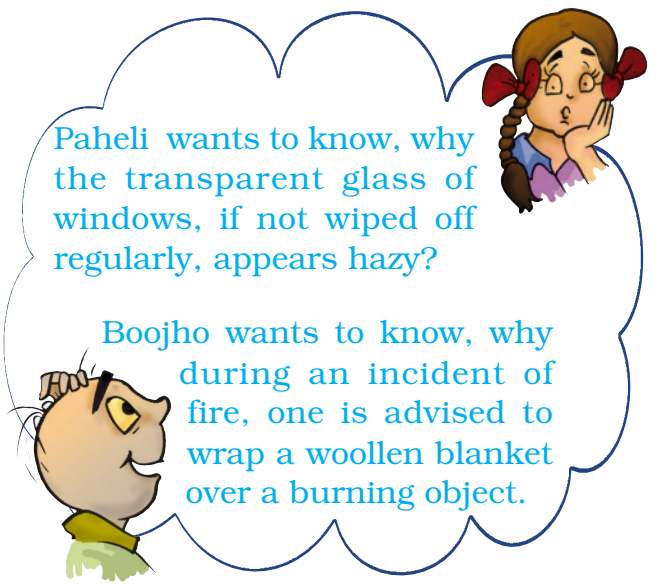
This shows that air also contains dust particles. The presence of dust particles in air varies from time to time, and from place to place.

We inhale air when we breathe through our nostrils. Fine hair and mucus are present inside the nose to prevent dust particles from getting into the respiratory system.

Do you recall being scolded by your parents when you breathe through your mouth? If you do that, harmful dust particles may enter your body.

We may conclude, then, that air contains some gases, water vapour and dust particles. The gases in air are mainly nitrogen, oxygen, small amount of carbon dioxide, and many other gases. However, there may be some





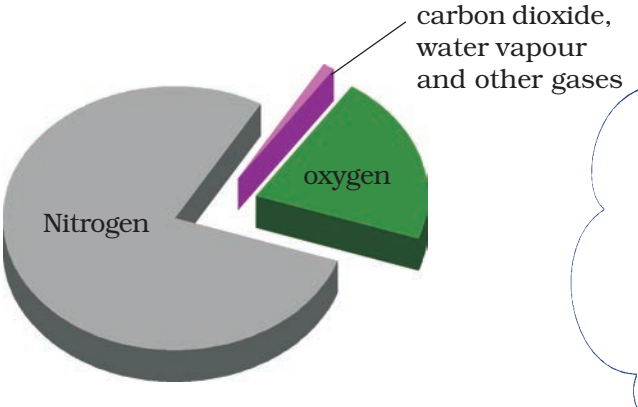


Fig.15.9 *Composition of air*

variations in the composition of air from place to place. We see that air contains mostly nitrogen and oxygen. In fact, these two gases together make up 99% of the air. The remaining 1% is constituted by carbon dioxide and a few other gases and water vapour (Fig. 15.9).

15.3 How does Oxygen Become Available to Animals and Plants Living in Water and Soil?

Activity 5

Take some water in a glass or metal container. Heat it slowly on a tripod stand. Well before the water begins to boil, look carefully at the inner surface

Fig. 15.10 *Water contains air*

Here is a question from Paheli, "Will the tiny air bubbles seen before the water actually boils, also appear if we do this activity by reheating boiled water kept in an air tight bottle?" If you do not know the answer you may try doing it and see for yourself.

of the container. Do you see tiny bubbles on the inside (Fig. 15.10)?

These bubbles come from the air dissolved in water. When you heat the water, to begin with, the air dissolved in it escapes. As you continue heating, the water itself turns into vapour and finally begins to boil. We learnt in Chapters 8 and 9, that the animals living in water use the dissolved oxygen in water.

The organisms that live in soil also need oxygen to respire, isn't it? How do they get the air they need, for respiration?

Activity 6

Take a lump of dry soil in a beaker or a glass. Add water to it and note what happens (Fig. 15.11). Do you see bubbles coming out from soil? These bubbles indicate the presence of air in the soil.

When the water is poured on the lump of soil, it displaces the air which is seen in the form of bubbles. The organisms that live inside the soil and the plant roots respire in this air. A lot

Fig. 15.11 *Soil has air in it*

of burrows and holes are formed in deep soil by the animals living in the soil. These burrows also make spaces available for air to move in and out of the soil. However, when it rains heavily, water fills up all the spaces occupied by the air in the soil. In this situation, animals living in the soil have to come out for respiration. Could this be the reason why earthworms come out of the soil, only during heavy rains?

Have you ever wondered why all the oxygen of atmosphere does not get used up though a large number of organisms are consuming it? Who is refilling the oxygen in the atmosphere?

15.4 How is the Oxygen in the Atmosphere Replaced?

In Chapter 7, we read about photosynthesis. In this process, plants make their own food and oxygen is produced along with it. Plants also consume oxygen for respiration, but they produce more of it than they consume. That is why we say plants produce oxygen.

It is obvious that animals cannot live without plants. The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals and by the photosynthesis in plants. This shows the interdependence of plants and animals.

We can now appreciate, how important air is for life on earth. Are there any other uses of air? Have you heard about a windmill? Look at Fig. 15.12.

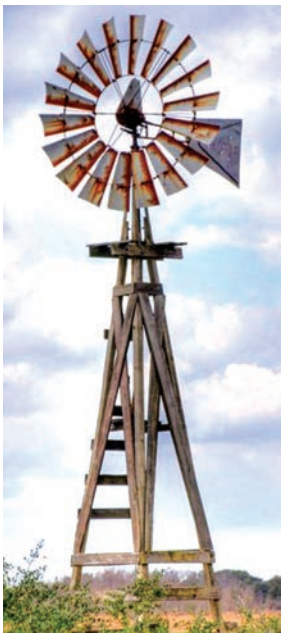


Fig. 15.12 *A windmill*

The wind makes the windmill rotate. The windmill is used to draw water from tubewells and to run flour mills. Windmills are also used to generate electricity. Air helps in the movements of sailing yachts, gliders, parachutes and aeroplanes. Birds, bats and insects can fly due to the presence of air. Air also helps in the dispersal of seeds and pollen of flowers of several plants. Air plays an important role in water cycle.

Key words

Atmosphere
Carbon dioxide
Composition of air
Oxygen
Nitrogen
Smoke
Windmill

Summary

- Air is found everywhere. We cannot see air, but we can feel it.
- Air in motion is called wind.
- Air occupies space.
- Air is present in water and soil.
- Air is a mixture of nitrogen, oxygen, carbon dioxide, water vapour and a few other gases. Some dust particles may also be present in it.
- Oxygen supports burning and is necessary for living organisms.
- The envelope of air that surrounds the earth is known as atmosphere.
- Atmosphere is essential for life on earth.
- Aquatic animals use dissolved air in water for respiration.
- Plants and animals depend on each other for exchange of oxygen and carbon dioxide from air.

Exercises

1. What is the composition of air?
2. Which gas in the atmosphere is essential for respiration?
3. How will you prove that air supports burning?
4. How will you show that air is dissolved in water?
5. Why does a lump of cotton wool shrink in water?

6. The layer of air around the earth is known as _____.
7. The component of air used by green plants to make their food, is _____.
8. List five activities that are possible due to the presence of air.
9. How do plants and animals help each other in the exchange of gases in the atmosphere?

SUGGESTED PROJECTS AND ACTIVITIES

1. On a clear glass window facing towards an open area, fix a small rectangular strip of paper. Remove the strip after a few days. Do you notice a difference between the rectangular section that was left covered with paper and the rest of the glass window? By repeating this exercise every month, you can have an idea about the amount of dust present in air around you at different times of the year.
2. Observe the leaves of trees, shrubs or bushes planted by the roadside. Note whether their leaves have some dust or soot deposited over them. Take similar observations with the leaves of trees in the school compound or in a garden. Is there any difference in deposition of soot on leaves of trees near the roadside? What could be the possible reasons for this difference? Take a map of your city or town and try to identify regions in the map where you have noticed very thick layer of soot on the plants by the roadside. Compare with results obtained by other classmates and mark these areas on the map. Perhaps the results from all the students could be summarised and reported in newspapers.