



7

AIR

Dear student, in the previous lesson we read about the importance and conservation of water in the Vedas. In this lesson, you will learn about air. Air is also one of the five great elements. We do not see the wind. We often feel it around us, such as when the wind blows or when we have to cycle against the wind or when we fill the air in a bicycle or football.

In reality, there is a small layer of air around the Earth, a thick layer of air is called the atmosphere. Life on Earth is not possible without air. We breathe in air. It is fuel from the air that burns our food. Air is also the root of all the changes in the weather.

What is the composition of air? What is the mixture of gases in it? What are its uses in life? We will study all these things in this lesson.

**OBJECTIVES**

After reading this lesson you will be able to

- know the composition of air;



- To know the usefulness of air for plants; and
- To know our contribution in keeping the air clean for a healthy life.

7.1 PROPERTIES OF AIR

Air is colorless, odorless and tasteless. It is a mixture of many gases. We can see through it. Apart from these, there are some other properties of air :

1. Air surrounds the place
2. There is a load in the air,
3. Air exerts pressure,
4. The volume of air can be reduced by compressing it.

Let us know these properties in detail.

The air surrounds the space

(?) Matter surrounds space. Air is also a substance. Like any other substance, air also occupies the space. You look at a glass that does not contain anything. Is it empty? Is it really not empty at all? The empty space inside is filled with air.



ACTIVITY 7.1

What you have to do: Prove that air encircles space.

What you need: Water in a transparent bottle and bucket.

How to do: Close the mouth of the bottle with the thumb. Now immerse it completely in water. Gently remove the thumb



See what happens? Are bubbles coming out of the bottle? Is the water going inside the bottle?

Is it going? Just think where the bubbles are coming from.

Conclusion:

You noticed that the water entered the bottle when the mouth of the bottle was opened in water. Water has replaced the air. The air came out as bubbles. The empty bottle was filled with air.

You learned that the empty bottle actually contained air.

Air Has Weight

To make sure there is weight in the air, let's do an activity -

**ACTIVITY 7.2**

What you need to do: Prove that there is weight in the air.

What you need: Bicycle's rubber tube, spring balance, weights.

How to do it:

1. First weigh the unfilled tube in a spring balance and know the weight of it.
2. Now fill the rubber tube with air and make it full and again Find the weight.
3. Has the load increased now?

Did you see that there is a load in the air?



Air exerts pressure

The layer of air around the earth exerts pressure on the earth, which is called atmospheric pressure or air pressure. You should know that the air pressure at the sea level is the highest. As we move upstream from the sea level, the air pressure decreases. This happens because the amount of air decreases at height. Air exerts equal pressure everywhere. There are many uses of air pressure in our daily activities, which you will study in further classes. To prove that the air exerts pressure, let's do a small experiment.



ACTIVITY 7.3

What you need to do: Prove that air exerts pressure.

What you need: a glass, a piece of cardboard, water.

How to do it:

1. Fill the glass with water and fill it with cardboard. Move the piece.
2. Invert the glass while holding the cardboard on it tightly with the palm of one hand. Make sure that water does not fall from the glass in this process.
3. Now gently remove the hands from the cardboard.

What did you see: that even after removing the hand, the piece of cardboard remains stuck with the glass and does not fall down.

Do you know why this happened: This has happened because the air pressure is applied from the bottom to the top on the piece of cardboard.



The volume of air can be reduced by compressing it

There is no attraction force between the molecules of a gas. Molecules are very much far away from each other. Therefore, it is possible to reduce the volume of the gas by pressing it. Air, since it is a gas, can also be reduced by compressing it. This process is called compression. In fact, when you fill the air in the balloon, the air is compressed because the air outside which was spread over a large volume, is limited it to a small volume of the balloon.



INTEXT QUESTIONS 7.1

Write in the field in front of the following sentences whether the sentence is true or false.

1. There is no air inside an empty vessel. ()
2. There is a load in the air and it exerts pressure. ()
3. The air pressure is always in the downward direction. ()
4. Air pressure is highest on mountains. ()
5. As we rise above the sea level, the air pressure decreases.()

7.2 AIR COMPOSITION

Air is a mixture of several gases, mainly containing nitrogen, oxygen, carbon dioxide and small amounts of argon, helium, neon, hydrogen, etc. There is also some amount of dust, smoke and water content in the air, the percentage of which varies according to the environment.



Existing gases in the air are very important for our life in one form or the other. Let's go into some more detail about the main components of air and their importance in life.

Importance of various components of air

1. Nitrogen - Nitrogen gas is 78% of the total volume of the Earth's air. Nitrogen is an odorless and tasteless gas. It is neither flammable nor helpful in combustion.

2. Oxygen - About 21 percent of the total volume of air is of oxygen. Oxygen is also called Prana-Vayu. Without this, we cannot live. Pure oxygen is strong to smell. Nitrogen present in air reduces its sharpness. All plants and animals require oxygen for respiration. When we breathe, we take in oxygen from the air

and take out carbon dioxide. Oxygen itself is not flammable but is helpful for flammation. The more oxygen the burning fuel gets, the faster it burns. Have you ever wondered why the wood starts burning more quickly when we blow the wooden stove? Without oxygen nothing can burn. Imagine what would happen if there was only oxygen in the air? Once a fire sets up, it would be difficult to extinguish it. Let us know this fact through an activity

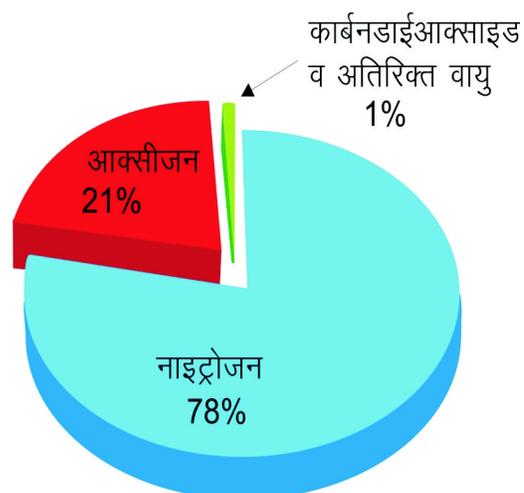


Fig. 7.1

**ACTIVITY 7.4**

What you need to do: Prove that oxygen is necessary for combustion.

What do you need: a small candle, matchmaker, a metal dish, a large glass.

How to do:

1. Put a candle in the middle of the metal dish and light it.
2. Cover the candle with a glass and keep watching for a while.

What you learned: That the candle extinguishes shortly after the glass is covered.

Do you know why this happened?

Because the glass cut-off the exposure of the inside air to the outside air. After some time the air inside the glass did not survive the oxygen required to keep the candle burning.

What you learned: Oxygen is required to burn an object.

Oxygen is used for artificial respiration. Climbers, sea divers and astronauts also carry oxygen cylinders to breathe. Hospitals have oxygen cylinders. The mere amount of oxygen dissolved in water is not enough for our breath, although it is sufficient for living beings in water.



Notes



3. Carbon-dioxide - Carbon dioxide is found in very small amounts in the air, yet it is a very important component of air. Carbon-dioxide is produced in the respiration and fuel burning process of plants and animals. It is used in the process of producing food by green plants. Carbon dioxide in the air also helps maintain a certain average global temperature. It is not helpful in combustion. It is a flame retardant gas. Have you ever seen red colored cylinders hanging on the walls of theaters, shops, buildings to extinguish the fire? When the glass on these is broken, carbon dioxide gas comes out of them, which extinguishes the fire.

4. Other gases - Other gases found in air are also very useful for us. For example, ozone prevents ultraviolet rays from the sun reaching the earth and thus protects us from their side effects.

5. Water Vapor - Water vapor is also found in the air which comes into the air when the sun rays evaporate from the earth's reservoirs. Have you noticed that the amount of water vapor in the air is not always the same; sweat does not dry easily in the rainy season. Let us make sure that there is water vapor in the air.

**ACTIVITY 7.5**

What you need to do: Prove that air contains water vapor.

What you need: A glass or glass pot and a few pieces of ice.

How to do you:

1. Put ice pieces in a glass pot and keep it for a while.
2. After a while, look at the outer surface of the vessel.



Notes

What you saw: Water droplets are seen on the outer surface of the vessel.

Do you know why this happened? This is because when the glass cools, the water vapor of the air coming in contact with its outer wall condenses and settles on the outer wall of the glass.

What have you learned: That there is water vapor in the air.

Note: This experiment becomes easily apparent in the rain, then there is a lot of water vapor in the air. It may not have been seen on a dry day. Repeat this experiment every season and in different seasons. Also draw conclusions from those experiments.



INTEXT QUESTIONS 7.2

1. Name the main components of air.
2. Which gas has the highest volume in air?
3. What would happen if there was only oxygen in the air?
4. How does water vapor develop in the air?

7.3 EQUILIBRIUM OF THE COMPONENTS OF AIR

You have already read that different gases are found in air in different quantities. In order to keep the environment around us healthy, balance must be maintained in these gases. Nature maintains this balance.



Study the carbon cycle shown in Figure 2.9. This explains how plants and animals use oxygen in respiration and how the balance of oxygen and carbon dioxide is maintained in the air. How the quantity of oxygen and carbon dioxide remains in nature from this cycle. Likewise, some similar cycles like nitrogen cycle, oxygen cycle etc. keeps the balance of other gases in the atmosphere unchanging.

Nature maintains balance, but the strange member of the biosphere i.e, human is disturbing this balance of nature. Imbalance in nature has occurred as a result of fast development being done by humans in industries, agriculture, cities and residential areas. Due to our thoughtless activities and exploitation of natural resources, many unwanted changes are taking place in the nature of air, water and soil. This is called pollution. Pollution is creating a very bad effect on human life.

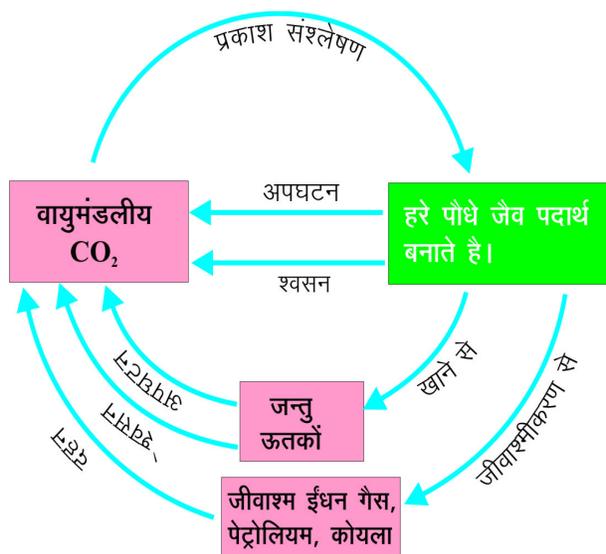


Fig. 7.2 Natural carbon cycle

The substances or factors that cause pollution are called pollutants. Generally, we talk about four types of pollutants - air, water, soil and noise pollution. Come let's learn about air pollution and its effects.

7.4 AIR POLLUTION

The mixing of gases or particulate matter harmful in the air causes air pollution. Air pollution is not only dangerous for our health, but it also spoils our environment. There are many reasons for air pollution, some of which are mentioned here.

Reasons of air pollution

The air around us can be polluted in many ways (Figure 2.10). The smoke from the factories also pollutes the air. That is why it is harmful to our health. Burning firecrackers on Diwali also contaminates the air. Therefore, in schools, children are taught to quit firecrackers. Do you know that the governments of many states have declared punishable crime of smoking cigarettes and bidis (?????) in all theaters, buses, auditoriums, schools and colleges, offices and other public places?



Fig. 7.3 A glimpse of air pollution

Smoke consists of very small carbon particles, which sit on the leaves of plants and disrupt the processes of photo-synthesis and respiration. If these particles of dust and carbon enter the human body, then it causes respiratory diseases like tuberculosis (TB), bronchitis.

When sulfur dioxide is found in rainwater, it becomes acidic. And thus acidic rain occurs. Acid rain damages plants and buildings and causes skin diseases in animals.



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Chlorofluorocarbons (), which are used in the refrigerant's fluid and aroma sprays, also contribute to air pollution. These react with the ozone of the air and eliminate it and due to this, holes have started to form in the ozone layer. Large amounts of the sun's ultraviolet rays reach the Earth through the holes in the ozone layer, which damages plants and causes skin cancer in animals.

When the amount of carbon monoxide and carbon dioxide in the air increases, the air retains more heat inside itself. Due to this, the average temperature of the earth starts increasing. This process is called global warming. You will read about this in further classes.

How can we prevent air pollution?

Once the balance of nature deteriorates, it becomes very difficult to improve it. So we should stop air pollution. We can save the air from getting polluted by the following ways.

1. Plant trees wherever possible.
2. Polluting industries should be kept away from the city.
3. Use only those things which do not disturb the environment.
4. Put air filters in the chimneys of the industries.
5. Use of compact, compressed natural gas in vehicles.
6. Take proper care of the machines so that they do not spread too much pollution.
7. Stop using chlorofluorocarbons.

**INTEXT QUESTIONS 7.3**

Fill in the blanks:

1. For a healthy environment, _____ of gases in the air must be kept stable.
2. Plants need _____ and _____ to make their food in sunlight.
3. Photosynthesis and respiration helps to keep the _____ of carbon dioxide and oxygen in the air stable.
4. Air pollution is _____ for our health.
5. Smoke contains small particles of _____.

**WHAT HAVE YOU LEARNT**

- The most important thing to maintain life on the earth is air. A thick layer of air surrounds the earth.
- Air is a substance. It carries a load. This space surrounds, pressures and can be compressed.
- Air is a mixture of gases. The main gases found in air are nitrogen (78%), oxygen (21%), carbon dioxide (0.03%) and other gases (0.97%).
- Nitrogen is essential for growth in plants and animals.
- Oxygen is needed for combustion of fuel and respiration of plants and animals. We cannot live without oxygen.
- Carbon dioxide is required to maintain the environment at a constant temperature and for photosynthesis in plants.



Notes



- Air contains water vapor, the quantity of which varies according to the weather.
- Imbalance in nature has increased due to increasing population, increasing residential areas, urbanization, industrialization, new agricultural techniques and technological development.
- Gases from industries, pesticides, scented sprays, dust, smoke, gases from vehicles, etc. are the main causes of air pollution.



TERMINAL QUESTIONS

1. Put a mark () in front of the correct answer:
 - (1) The amount of oxygen in the air is approximately-
() 0.03% () 1% () 21% () 78%
 - (2) The amount of nitrogen in the air is approximately-
() 0.03% () 1% () 21% () 78%
 - (3) The amount of carbon dioxide in the air is approximately.
() 0.03% () 1% () 21% () 78%
 - (4) Which of the following gases is not one of the main gases present in air?
() Nitrogen () oxygen () Neon () carbon dioxide
 - (5) The amount of water in the air-
() Is always the same everywhere.
() Is always zero everywhere.



- () Time and place varies by changing it.
- () By changing the place it changes, it always remains the same in one place.
- (6) Tell whether the following sentence is true or false -
- Air is a mixture of gases. ()
 - Air is essential for the existence of life on earth. ()
 - The fuel needs oxygen to burn. ()
 - We inhale oxygen and exhale carbon dioxide in exhalation.()
 - Carbon dioxide is found in air. ()
 - The amount of water vapor at a place remains the same in every season. ()
 - Nitrogen is necessary for plant growth. ()
 - Some bacteria help to keep the amount of nitrogen in the air constant. ()
 - Ozone protects us from ultraviolet rays coming from the Sun. ()
 - We should try to stop air pollution. ()
2. What is Air? What are its components?
3. Explain two uses -
- () Of nitrogen in air
 - () Of oxygen in air
 - () Of carbon dioxide in air

CLASS-II



Notes

4. Prove by an experiment that
 - () Oxygen helps in combustion (burning)
 - () Air has water vapor
 - () The air exerts pressure.
5. Write any three properties of air.
6. Explain how the amounts of oxygen and carbon dioxide in the air remain in equilibrium.
7. Explain how plants help in keeping the air clean.
8. What do you understand by air pollution? Write any four reasons for air pollution.
9. What four measures will you take to protect the air around you from pollution?
10. Which fuel is not polluted by using the atmosphere in buses and cars?



ANSWERS TO INTEXT QUESTIONS

7.1

1. False
2. Truth
3. False
4. Truth
5. Truth



7.2

1. Oxygen, nitrogen, ozone, water vapor
2. Nitrogen
3. Plants are not able to make food and when plants are not there then others organisms do not exist.
4. In condensation

7.3

1. Quantity
2. Carbon dioxide and water
3. Ratio of volume
4. Harm
5. Carbon