

Air Around Us

Learning Objectives

1. Air is a natural resource
2. We cannot see air but can feel it
3. Role of atmosphere
4. Oxygen cycle
5. Composition of air
6. Usefulness of air
7. Pollution of air

Air is also an important natural resource. Air is present everywhere, in water, around us, in soil and within plants and animals. Life on Earth is not possible without air. Air cannot be seen but it can be felt. When air blows hard, leaves and branches start moving. This movement signifies presence of air. Strong moving air is called wind and strong winds cause storms.

Presence of Air: We can feel air when we switch on a fan. We feel the cool breeze (air).

Atmosphere: The thin layer of air surrounding the Earth is called the atmosphere. All plants and animals need air to breathe.



Air Balloons

Properties of air

- Air occupies space.
- Air exerts pressure.
- Air cannot be seen but it can be experienced.

The atmosphere extends up to 1000 km above the surface of Earth. However this air gets thinner and thinner as we go up. That is why mountaineers have to carry their own oxygen supply in oxygen in cylinders. Ninety nine percent of air is found up to a height of 30 km above the surface of Earth.

Composition of air

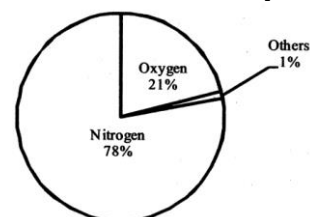
Air is a mixture of gases, water vapour and dust particles. Lavoisier was the first scientist to prove that air is a mixture of gases and not a compound.

He found that

(1) Air is a mixture of gases. Oxygen is the active part of air and make up about one fifth of air by volume.

(2) When certain substances are burnt in air, they combine with oxygen.

So air is a mixture and not a compound.



Composition of dry air. Dry air is without water vapour

Gas	Percentage by volume
1. Nitrogen	78.09
2. Oxygen	20.95
3. Rare gases (including argon and 0.018% neon)	01.00
4. Carbon dioxide	0.02 to 0.04
5. Impurities	Variable

Interesting Fact: Until the 18th century, people thought that air uses a single substance. In 1774, Joseph Priestly showed that part of air has oxygen. This proved that air is a mixture and not a single substance.

The combustion of petrol releases poisonous gases like carbon monoxide, nitrogen dioxide, nitrogen monoxide, lead, dust etc. which mixes with air and pollute it. Impurities from factories like Sulphur dioxide, dust and smoke get mixed up with air.

Constituents of air

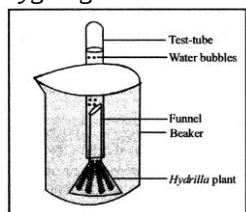
(a) Nitrogen: Air contains 78% of nitrogen. It occupies about 4/5th of volume of dry air. Nitrogen is inert gas but it is needed by plants and animals for making amino acids.

(b) Oxygen: Air contains about 21% oxygen.

To show that plants produce oxygen during photosynthesis

Take a beaker half filled with water and place a water plant (say, Hydrilla) in the beaker. Invert a glass funnel and place it over the plant and cover the open-end of the funnel with a test tube. (Before doing so, fill the test tube with water and cover its opening with your thumb. Then, invert the tube into the funnel.).

Place the beaker in sunlight and observe. You will notice bubbles of gases coming from the leaves of the plant and filling the test tube. Introduce a glowing splint near the mouth of the test tube. It continues to glow, proving the presence of oxygen gas in the air.



Experiment shows that plants produce oxygen

Conclusion:

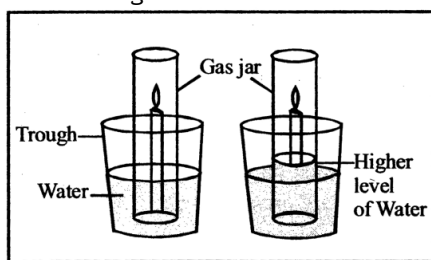
Plants produce oxygen during the process of photosynthesis and liberate it into the atmosphere.

To show oxygen is used in burning

Fix a candle in the centre of a trough. Fill the trough with water more than half.

Light the candle. Place a gas jar over the burning candle upside down as shown in the figure alongside. Observe and say what is happening? Does burning candle burn continuously or gets extinguished? It extinguishes after a while and at the same time, the level of water in the gas jar rises. Can you explain why this happens? After putting the gas jar on the burning candle, the candle burns for while, because there is some oxygen in the air, which helps burning.

When all oxygen is consumed in burning, the candle extinguishes.



Experiment shows that oxygen is required in burning

Conclusion: Oxygen helps in burning.

Used of oxygen

1. Oxygen is necessary for breathing and burning.
2. It is needed in hospitals for artificial respiration.
3. Mountaineers, sea divers and astronauts carry oxygen cylinders with them as supply of oxygen decreases as we go up.
4. Oxygen is needed by aquatic plants and animals.

5. It is used for welding purposes and for cutting of metal at high temperatures.

6. Liquid oxygen is needed in rockets for combustion of fuels.

(c) **Carbon dioxide:** Carbon dioxide occupies a very small percentage of air but is very important for existence of all plant life. It occupies 0.02 - 0.04% of air by volume. It is released during

(i) combustion of fuels like coal, diesel, petrol, etc.

(ii) the process of respiration.

(iii) decomposition of vegetable matter and fermentation.

Uses of Carbon dioxide

1. It is used as a fire extinguisher since it is heavier than air and does not burn.

2. Solid Carbon dioxide is called dry ice. It is used as a refrigerant.

3. It is used in preparation of aerated drinks like soda water etc.

4. Plants use carbon dioxide to prepare their own food by the process of photosynthesis. Oxygen is given out during the process.

(d) **Water Vapour:** Air contains water vapour. We know this because when air comes in contact with a cool surface, water drops are seen. Water vapour is important for water cycle.



Air contains water vapour

The clothes dry on clothesline. The water from wet clothes evaporates and forms water vapour. This mixes with air. Amount of water vapour in air is called **humidity**.

(e) **Dust and Smoke:** Dust particles can be seen in a beam of sunrays.

These dust particles are present in air. Content of dust particles vary from time to time from place to place. When it rains, dust particles in the atmosphere settle down. That is why weather is clean after rainy season.

Air also contains smoke released from factories and vehicles.



Air contains dust particles

Do You Know

The air that we breathe out is saturated with water. Through this we can lose about one third of a litre of water every day.

Respiration: It is process by which air rich in oxygen is breathed in by an organism and air rich in carbon dioxide is breathed out.

Air support life - All living things breathe in oxygen. Oxygen is needed to get energy from food. Living things on land breathe in oxygen present in air. The air that is taken in through nose enters the lungs. Here the oxygen is absorbed from the air and used by the body.

Living things that live under the soil breathe in air present in soil. If you put water on the soil you may see some bubbles of air. This is because air is trapped between soil particles which escape when water is added. Plants that live in water logged soil such as mangroves, have roots that grow out of the soil to get air.



Mangroves

Activity 8

To prove that the soil also entraps air (oxygen). Take a lump of dry soil in a beaker. Add some water to it. Do you observe bubbles start coming out from the soil. Yes, it is air entrapped in soil. Organisms living in burrows and holes formed in deep soil get this entrapped air.

But, when it rains heavily, these burrows and holes are filled with water, air is expelled. It becomes very difficult for these animals to

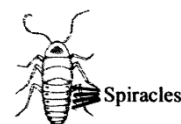
remain there. So they come out of burrows and holes.

Some animals that live in water, e.g., whales come up to the surface to breathe in oxygen from air. Fish have organs called gills. They breathe in oxygen dissolved in water. When water enters the gills, oxygen dissolved in water is absorbed.

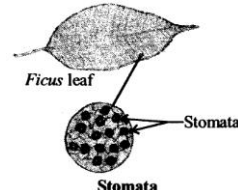
Activity 7

Do You Know

Insects like cockroach and housefly take in oxygen through tiny holes in their body called spiracles.



Leaf has pores on both surfaces (called stomata) for exchange of gases.



How do fishes and other aquatic animals breathe in water?

Where from the aquatic animals get oxygen?

Have some water in a beaker. Heat it slowly on a tripod stand. After some time, you can observe a lot of bubbles at the bottom of the beaker, which start rising up and break up at the outer surface of water. Where do these bubbles come from? These bubbles are mainly of oxygen present in air which has been dissolved in water. Aquatic animals use this oxygen and survive.

Plants have small openings called stomata on the lower side of leaves through which air is taken in. Plants that float on water like water lily have stomata on the upper surface. Underwater plants like tape grass have no stomata. They breathe in oxygen dissolved in water through their body surface.

Amphibians like frog, newt and salamander need systems for breathing both in air and water. Crocodile and alligator swim with the snout above water surface to breathe easily through nostrils.



Frog

Frogs have lungs to breathe in air when they are on land. In water they breathe through moist skin.

Birds have an efficient respiratory system. They need high levels of oxygen during flight. Their lungs have air sacs that remain open all the time.



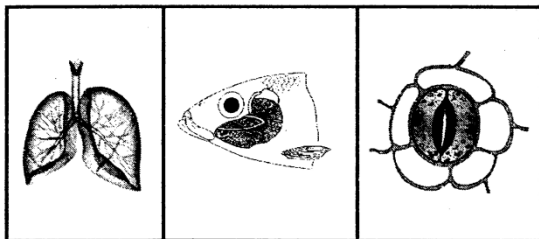
Bird

Do You Know

Earthworms respire through their skin surface that is moist due to mucous.



Mammals breathe with the help of lungs. They take in oxygen and give out carbon dioxide.



Respiration in animals and plants

Balance of oxygen: The amount of oxygen in the atmosphere remains constant because of oxygen and carbon dioxide cycle that operate together in nature.

All animals breathe out carbon dioxide. Plants take in carbon dioxide and exhale oxygen. Humans and other animals inhale oxygen. This process goes on forever. Plants and animals are interdependent on each other.

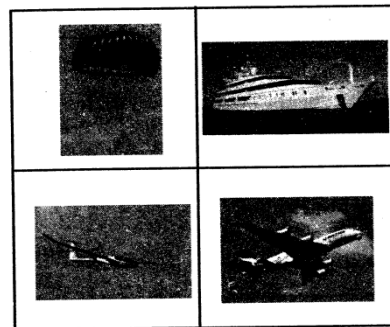
Some human activities however disturb this balance. Such activities include deforestation, use of fossil fuels, pollution, industries, etc.

Other uses of Air

1. Windmill runs with the help of air. It is used to generate electricity.
2. Gliders, parachutes, yachts and aircraft all need air to sail and fly.



Windmill



Some uses of air

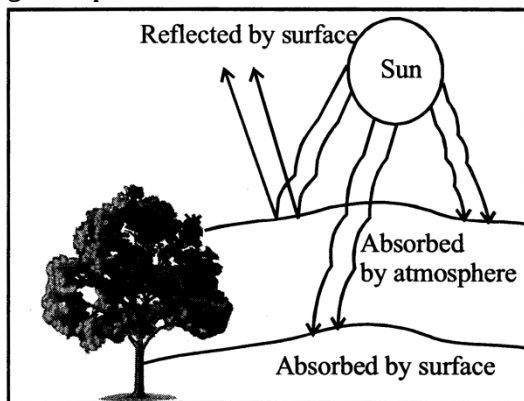
3. Insects, birds and bats need air to fly.
4. Some fruits and seeds need air to disperse their seeds.
5. Air is needed for winnowing.
6. Tyres are filled with air to run vehicles.
7. Air helps in pollination of several flowers.

Ozone: There is another layer of gas called ozone in the upper atmosphere. It prevents harmful rays of the sun from reaching Earth. These are ultraviolet rays and may cause skin cancer and eye problems.

Role of Atmosphere: Atmosphere causes weather changes. When the sunshine's brightly, it heats the Earth. The air also gets heated. Hot air rises and cold air pushes in to take its place. This is how wind blows. Blowing of storms and cyclones is also due to movement of air. The water vapour in the air is responsible for rainfall and snowfall. Thus the atmosphere is responsible for weather changes. The atmosphere helps to maintain the temperature of the Earth. The heat of the sun is partly absorbed by the atmosphere, and partly is reflected back. This prevents the

Earth from becoming very hot during the day. At night the trapped heat prevents the Earth from cooling down too much.

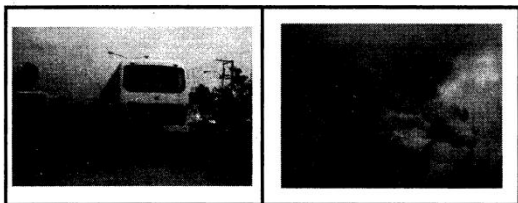
Thus the atmosphere acts as a blanket around the earth and helps to keep the earth's surface at right temperature for life to exist.



Air pollution: Air is getting polluted day by day due to some human activities.

Some major causes of contamination of air are

- (i) Burning of fossil fuels like coal, petroleum
- (ii) Smoke from vehicles
- (iii) Harmful gases from industries
- (iv) Burning of wood, plastic tyres
- (v) Deforestation



Due to poor quality of air, people find it difficult to breathe. It may cause diseases like asthma and lung cancer. It also affects plant life and crops.

In order to protect our environment we should plant more trees, recycle plastics, avoid using fossil fuels.

Keywords

Atmosphere: It is the thick blanket to fair surround the Earth's surface.

Gravity: The pull of the earth on bodies

Humidity: Amount of water vapour present in air at any place and time.

Ozone: A gas present in upper atmosphere that prevents us from harmful ultraviolet rays of the sun.