



Air

We'll cover the following key points:

- Air and its Components
- Properties of Air
- Uses of Air
- Air Pollution



Hi, I'm EeeBee

Do you Remember:

Fundamental concept in previous class.

In class 2nd we learnt

- What does air contain?
- Air pollution

In class 3rd we learnt

- Air Pollution

Still curious?
Talk to me by
scanning
the QR code.



Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the concept of air and its components, including oxygen, nitrogen, carbon dioxide, and other gases.
- Explain the properties of air, such as its ability to exert pressure, expand, and its role in sustaining life on Earth.
- Identify the various uses of air, including its role in breathing, combustion, and supporting life on Earth.
- Describe air pollution, its causes, effects, and measures to prevent and control it.

Guidelines for Teachers

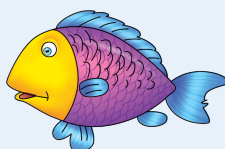
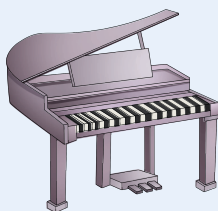
The teacher can begin the chapter by discussing the significance of air for life on Earth and introducing the composition of air, including the major gases present. Use diagrams or models to show how air is made up of various gases and how each component plays a vital role. Explain the properties of air, such as its ability to exert pressure and support life, through simple experiments, like using a vacuum pump to demonstrate air pressure. Discuss the uses of air in everyday life, including respiration and combustion, with real-life examples. Additionally, introduce the concept of air pollution by discussing its causes (e.g., industrial emissions, vehicle exhaust) and its impact on health and the environment. Encourage students to explore ways to reduce air pollution in their communities through various prevention and control measures.



Warm Up

Experiential Learning

Look at these pictures. Circle the objects which need air to grow.



Fun Fact



Honey is the only food that never spoils! Ancient jars found in Egyptian tombs are still edible after 3,000 years. It's all thanks to honey's low moisture content and acidic pH, which prevent bacteria from growing. This natural sweetener was even used in ancient medicine. Talk about the ultimate long-lasting snack!

Air and its Components

What is Air?

Air is all around us and it is one of the most important things in our lives. But how much do we actually know about air?

Take a large, deep breath. Inhale. Exhale. Do it again. Inhale. Exhale. Let's think about what exactly is happening in our body that is allowing us to breathe. Well, when we **inhale**, or breathe in, our lungs fill up with oxygen that is passed to our bloodstream. **Air** is a gas that provides us with oxygen. Without air, living things would be unable to survive, including plants, animals and human beings.

You cannot see air but it is all around us. Surrounding us is a thick blanket of air called the **atmosphere**. Without the atmosphere there would be no life on Earth. The atmosphere is the air that plants and animals breathe to survive.



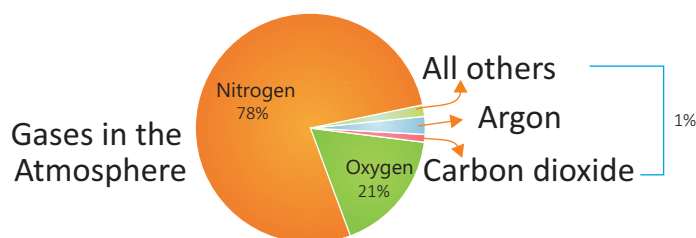
Take a Task

Watch Remedial

What Does Air Contain?

Air is a mixture of gases. It contains the following gases :

- ✦ More than three-fourths of air is a gas called nitrogen (78%).
- ✦ About one-fifth is the gas Oxygen (21%). Oxygen is needed by animals to breathe and carbon dioxide is used by plant in photosynthesis.
- ✦ There are lots of other gases that are part of the atmosphere, but in much smaller amounts. These include argon, carbon dioxide, neon, helium, hydrogen and more.
- ✦ Besides these gases, air contains water vapour, dust and smoke. The amount of these varies from place to place and from time to time.



Did you know ?

It is estimated that indoor air is 5 times more polluted than the outdoor air. So as the temperature rise, let the fresh air in.

Air is a matter. Matter is anything that has mass and takes up space. So, in order to prove that air is matter, we need to prove that air has mass and takes up space, which we shall find in the experiments given later.

Humidity

The amount of water vapour in air is called **humidity**. It varies according to the location of a place and the weather. A place near the sea has greater humidity than a place away from the sea. Mumbai is more humid than Delhi as it is near to the sea.

Activity

Creative Learning

How to Prove Water Vapour is Present in Air?

Do you know water vapour is present in the air? Water vapour is a gaseous form of water. Let's prove that water vapour is present in air?

Materials: Clean glass tumbler, Dry towel, Ice cube

Instructions

Wipe the outside of the glass with a clean dry towel to ensure it is dry from the outside.

Place a few ice cubes inside the glass and wait for a few minutes.

Observe: You would notice the outside of the glass turns misty and finally droplets of water appear on the outside of the glass.

How does the water comes outside the glass?

This happens because of condensation. Water vapour is present in air and when it comes in contact with cold objects it changes into liquid form.

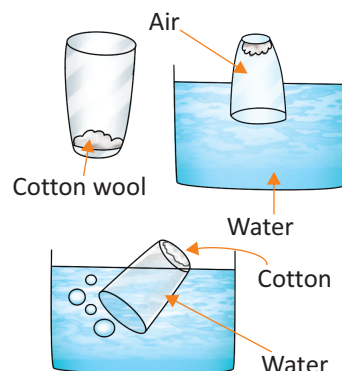
Properties of Air

Air occupies space

Apparatus Required : Glass, bowl of water, cotton wool

Steps:

- (i) Press a piece of cotton wool into the bottom of the glass.
- (ii) Put the glass upside down into the bowl of water. Take the glass out, the cotton wool is dry.
- (iii) Now tilt the glass slightly and put it into the bowl of water. Air bubbles are seen and water goes into the glass.



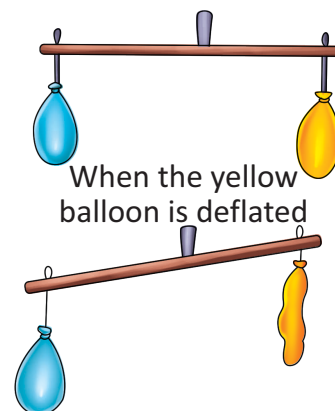
Observation and Result : In step (ii) the cotton wool was dry because there was air in the glass and water could not go in. In step (iii) we see air bubbles, which means air escapes out and water goes in the glass. This shows that air occupies space.

Air has weight

Apparatus Required: 2 balloons, 1m long stick with a string tied at the center

Steps:

- (i) Fill the 2 balloons with equal amount of air (Approx.).
- (ii) Tie each balloon to each end of the stick respectively.
- (iii) Now remove air from one of the balloons.



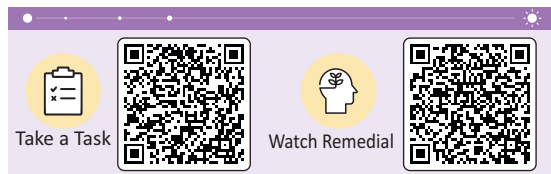
Observation and Result: In step (ii) the stick is in horizontal position. In step (iii) we observe that side of the stick with the air filled balloon goes down, thus proving that air has weight.

Air is Colourless

Air is invisible: it has no colour. If you see that the air is coloured, it is because it is full of dust, smoke or pollution.

Air does not have definite shape or volume

If you blow air into a balloon, it takes the shape of the balloon. If you now let the air out in a room, it will spread all over the room. It now takes up more space than it did. This shows that air does not have definite shape or volume.



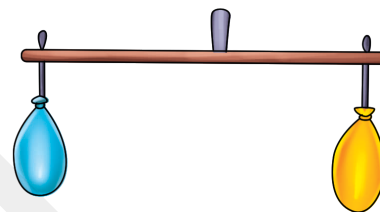
Air Takes up Space

You can prove this by blowing up a balloon. The balloon expands because you are putting something into the balloon i.e. air. This air takes up space, so the more air you put into the balloon, the more space it takes up. When you use a pump to blow up a football, you put air into it - this air takes up space which is why the football expands.



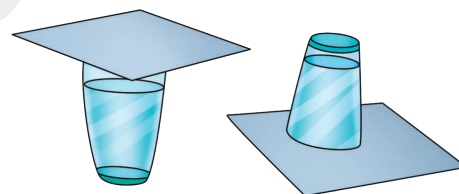
Air has Mass

Place an empty balloon on a scale and weigh it. Take this same balloon and inflate it. Weight it again. What do you see? A really clear way to show this is to make a balance with a stick or coat-hanger suspended by a string in the middle. Tie an empty balloon on each side to prove they weigh the same. Inflate one balloon and hang it again. That side of the balance will be heavier. If air had no mass, there would've been no change.



Air Exerts Pressure

Fill the glass with water up to the brim. Cover it with a cardboard piece and turn the glass upside down. Slowly remove your hand. The cardboard does not fall and water stays in the glass. Air pushes the cardboard up and prevents it from falling. This experiment shows that air exerts pressure.



Uses of Air

Air is Needed for Burning

Air supports burning or combustion. The oxygen present in air is essential for burning.

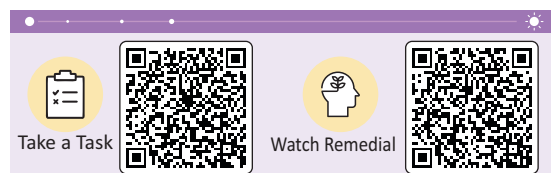
Light the candle with the help of a match stick and fix it on a plate. Now cover the burning candle with a glass. You will notice that the candle goes off in a few seconds.

The candle flame was there for sometime after putting the glass as there was air in the glass. Once the air is used up, the candle cannot continue burning.

The part of air used up in burning is oxygen and carbon dioxide was given out.

Air is Needed for Breathing

Air contains oxygen, which is essential for life. All living things respire by breathing in air. The air we breathe in is inhaled air. The air we breathe out is exhaled air.



Did you know ?

An average person inhales 16kg of air in one day.

Air is Needed by Plants

Carbon Dioxide of the air is used by the plants for making food in the process of photosynthesis.

The nitrogen present in air is essential for the growth of plants. Plants take in nitrogen directly from the air or from the soil.

Check 'N' Mate

Write 'T' for true and 'F' for false statements.

1. Without the atmosphere there would be no life on the earth.
2. Air is colourful. It has many colours.
3. Air does not have definite shape or volume.
4. The oxygen present in air is essential for burning.
5. Oxygen of air is used by the plants for making food.

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Air Pollution


Air pollution occurs when gases, dust, smoke, or odour get into the air and make it unclean. Air pollution is unsafe for humans and animals to breathe and for plants to live with.


Air Pollutants-They are the substances which pollute the air. Some of the common pollutants are dust, soot, ash, carbon monoxide, excess of carbon dioxide, sulphur dioxide, oxides of nitrogen, hydrocarbons, chlorofluorocarbons (CFC), lead compounds, asbestos dust, cement dust, pollens and radioactive rays.


Causes of Air Pollution

- ✦ Smoke and harmful gases containing particles of dust and heavy metals are released by industries.
- ✦ Harmful gases and chemicals are also released by the vehicles into the air.
- ✦ Bursting of crackers also give out harmful smoke and make the air unhealthy for breathing.


Take a Task




Watch Remedial



Did you know ?

In December 1952, air pollution in London created fatal smog that immediately killed 4,000 people and then 8,000 more in the following weeks. Burning coal was the main cause.

Effects of Air Pollution

- ✦ Causes depletion of ozone layer due to which ultraviolet radiations can reach the earth and cause skin cancer, damage to eyes and immune system.
- ✦ It affects respiratory system causing breathing difficulties and diseases such as bronchitis, asthma, lung cancer, tuberculosis and pneumonia.
- ✦ It causes greenhouse effect and global warming which leads to excessive heating of earth's atmosphere.

Preventive Measures

- ✦ Use of public transport and try to make use of car pooling. Automobiles should be properly maintained and less polluting fuels such as CNG should be used.
- ✦ Tall chimneys should be installed in factories. Industries should be located far away from the residential area. Better designed equipment and smokeless fuels should be used in homes and industries.
- ✦ Renewable and non-polluting sources of energy like solar energy, wind energy etc. should be used.
- ✦ More trees should be planted along roadsides and houses.

Check 'N' Mate



Critical Thinking

Fill in the blanks with correct words.

1. Air pollution is _____ (safe/unsafe) for humans and animals.
2. Smoke and harmful gases contain particles of _____ (dust/iron).
3. Air pollution causes greenhouse effect and global warming which leads to excessive _____ (heating/cooling) of earth's atmosphere.
4. More _____ (trees/indust) should be planted along roadsides and houses.

Time to Apply

Applying and Creating

Mr. Singh had wiped his car dry in the evening, but the next day, he saw that his car was wet again even though it had not rained at night. Explain what might have happened at night?



In a Nutshell

- ✦ Air is all around us and is very essential for all living beings.
- ✦ Air is a mixture of various gases such as (nitrogen, oxygen, carbon dioxide, hydrogen, helium), water vapour, smoke, dust particles etc.
- ✦ Air occupies space and has weight. Therefore, air is a matter.
- ✦ The amount of water vapour present in the air is called humidity.
- ✦ Air is colourless, does not have a definite shape and volume and can exert pressure.
- ✦ Uses of air are—living things need air to stay alive; air is used for burning and is needed by plants for the process of photosynthesis.
- ✦ Air pollution is caused by smoke and harmful gases released by vehicles and factories, burning of leaves and harmful gases from garbage dumps.
- ✦ Air pollution leads to skin cancer, bronchitis, asthma, tuberculosis etc. It causes greenhouse effect and global warming.
- ✦ Planting more trees, use of less polluting fuels, making use of car pooling, use of solar and wind energy can help in reducing air pollution.



Key Words

Condensation	: The conversion of a vapour or gas to a liquid.
Invisible	: Unable to be seen
Combustion	: Burning
Depletion	: Weakened
Greenhouse effect	: The problem caused by increased quantities of gases such as carbon dioxide in the air. These gases trap the heat from the Sun, and cause a gradual rise in the temperature of the Earth's atmosphere.
Global warming	: Increase in the Earth's temperature
CNG	: Compressed Natural Gas

Improving Vocabulary



Time to Discuss

Pondering and Communicating

1. We should plant more trees to prevent pollution. Why do you think so?
2. Why does a lump of cotton wool shrink in water?



Gap Analyzer™



EXERCISE

That turn curiosity into confidence—let's begin!



A. Objective Type Questions.

1. CNG is a
 - a. Polluted fuel
 - b. Clean fuel
 - c. Harmful fuel
2. Which of these is not a source of air pollution?
 - a. Automobile exhaust
 - b. Burning of firewood
 - c. Windmill
3. Rahul wants to contribute in reducing air pollution. Which vehicle should he use?
 - a. Car
 - b. Cycle
 - c. Auto rickshaw
4. Which of the following supports burning?
 - a. Oxygen
 - b. Nitrogen
 - c. Hydrogen
5. Which of the following components of air is present in largest amount in the atmosphere?
 - a. Nitrogen
 - b. Carbon dioxide
 - c. Water vapour

B. Choose the correct answer :

1. As we go to higher altitudes air becomes (more/less).
2. Exhaled air contains more amount of (oxygen/carbon dioxide).
3. The percentage of Oxygen gas in air is (21%/78%).
4. Inhaled air is rich in (oxygen/nitrogen).
5. Blood in the (lungs/heart) take oxygen from the air we breathe in.

C. Fill in the blanks :

1. The air we breathe out is called _____.
2. The thick blanket of air is held around the earth by the earth's _____.
3. The air we breathe in is called _____ air.
4. The air we breathe out is called _____ air.
5. _____ is a mixture of gases.
6. A fuel that causes less air pollution _____.
7. The amount of water vapour in the air is called _____.

D. Short Answer Questions.

1. What is the composition of air?
2. A candle goes off after sometime when it is covered by a jar or a tumbler. Why?
3. What is air pollution?
4. Write the name of few pollutants that pollute the air.
5. What do you understand by green house effect?

E. Long Answer Questions.

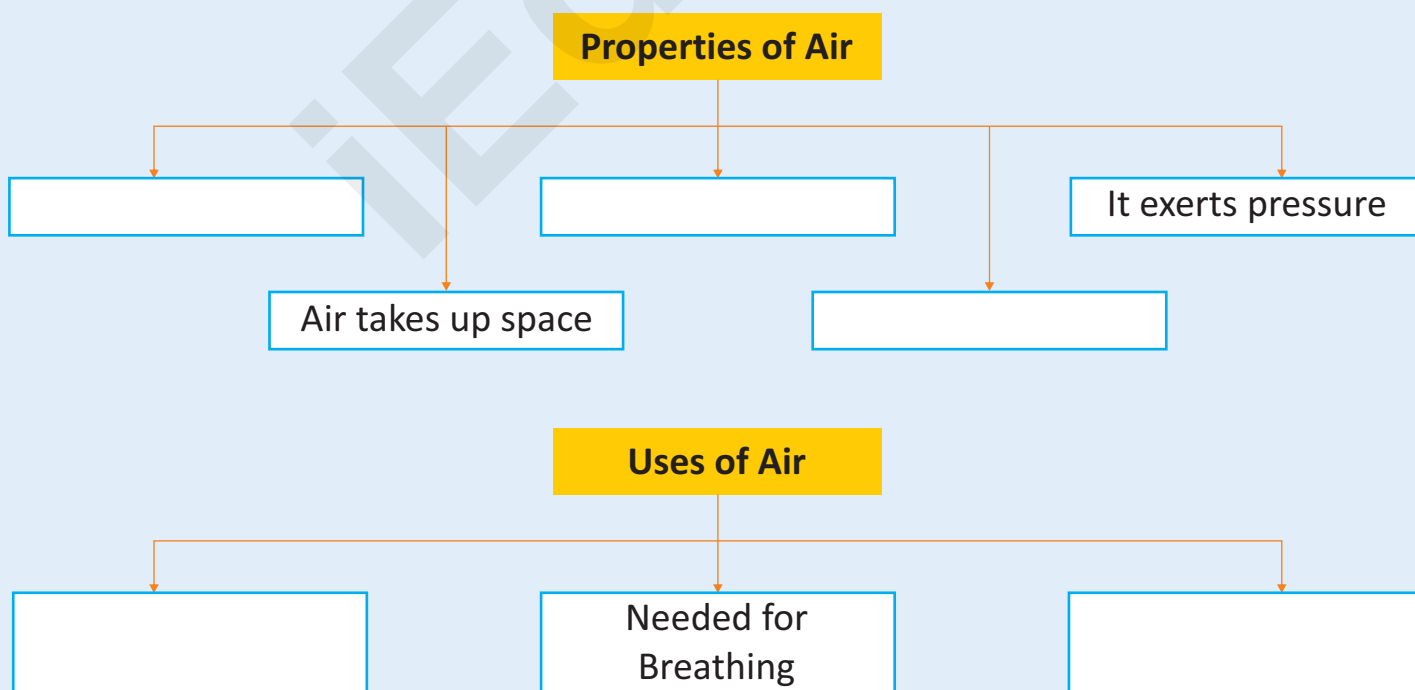
1. How can you prove that air is a matter?
2. How can you prove the presence of water vapour in the air?
3. What are the different properties of air?
4. What are the different causes of air pollution?
5. Write down the different effects of air pollution.
6. What are the ways in which air pollution can be controlled?
7. Write a short note on greenhouse effect and global warming.



Time to Recall

Remembering and Analysing

Recall and complete the concept map given below.

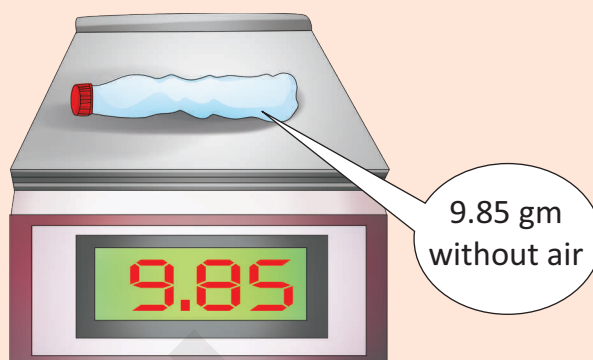




Time to Observe

Observing, Critical Thinking, Analysing

Study the picture and answer the following:



The crushed bottle weighs less than the one with air because _____.



Time to Create

Creating and Collaborating

Make your own pinwheel.

1. Begin with a square paper.
2. Fold your square, corner to corner and then unfold.
3. Make a pencil mark about $\frac{1}{3}$ of the way from centre.
4. Cut along fold lines.
5. Bring every other point into the centre and stick a pin through all four points.
6. Now fix it on a piece of stick.
7. Your pinwheel is ready to rotate in the wind.
8. Take to a place where wind is blowing or hold it in your hand and run.

