

Composition of air

OBJECTIVES

By the end of this topic, students should be able to:

1. State the percentage composition of air.
2. Identify respiratory gases.
3. Describe the test for carbon dioxide gas.
4. Test for oxygen gas.

COMPOSITION OF AIR

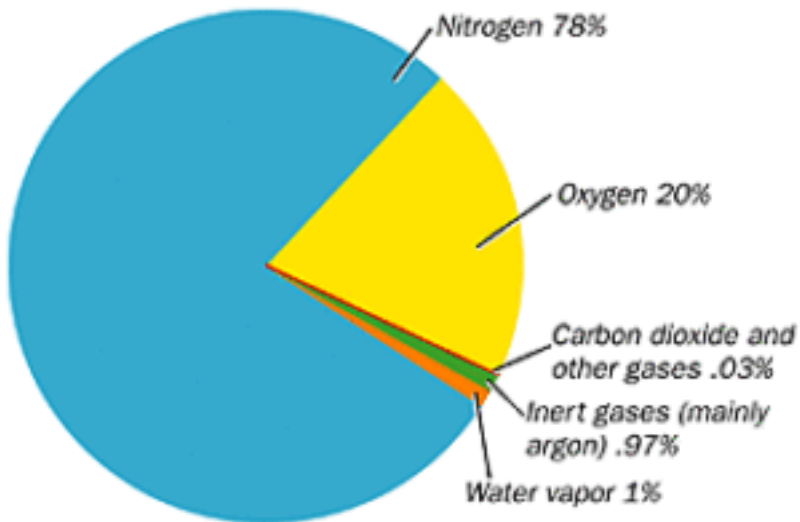
- The air around us is made up different gases such as oxygen, nitrogen, carbon dioxide and water vapor and other rare gases.

Composition of the Air by Volume

<u>Gas</u>	<u>Amount of gas in percentage(%)</u>
<u>Nitrogen</u>	78
<u>Oxygen</u>	20
<u>Carbon-dioxide</u>	0,03
<u>Water vapour</u>	0-2
<u>Noble (rare) gases</u>	Less than 1

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Pie Chart of the Gases that make up air and the proportions in which they normally occur.



- The total volume of air decreases with increasing height above the ground..
- The air gets thinner the higher we go because the higher we go, the less pressure there is.

OXYGEN

- It is the second abundant gas in the air, about one-fifth of the air is made up of oxygen.
- It is difficult to breath at high altitudes because the higher the less air there is and therefore the less oxygen there is.

CARBON-DIOXIDE

- It makes up a much smaller volume of the air compared to nitrogen and oxygen (only about 0.03).
- It is released into the air through respiration and combustion.

- It is made up of one part of one part carbon and two parts oxygen thus CO

WATER VAPOUR

- This is the gaseous state of water, it is part of the water cycle.
- Hot air can hold more water vapour than cold air.
- The air that we exhale is rich in water vapour, because our lungs are very moist.

Identifying the respiratory gases

- The air we inhale contains more oxygen and less carbon-dioxide than the air we exhale.
- The table below shows the percentage composition of inhaled and exhaled air:

Gas	Inhaled air (%)	Exhaled air (%)
Oxygen	21	16
Carbon-dioxide	0,03	4
Nitrogen	78	78
Water vapour	A small percentage	A larger percentage

- All the basic functions and activities in your body require energy, respiration is the process of burning food in our body cells to produce carbon dioxide, water and energy.

- This only happens in the presence of oxygen.
- When we breathe in and out, our lungs take oxygen from the air into our blood.
- The primary organs of the respiratory systems are the lungs which carry out this exchange of gases as we breathe.
- Oxygen is transported by the blood to the cells where respiration occurs.
- The cells produce carbon dioxide during the process.
- The carbon dioxide is carried to the lungs, where it is removed from your body by exhalation (breathing out).

OXYGEN GAS

- It is the important gas in the air.
- We breathe in oxygen to use it for respiration.

EXPERIMENT

AIM: To test for oxygen

Materials

- Manganese dioxide
- Hydrogen peroxide
- Wooden splint
- A jar oxygen
- Matches

Procedures

1. Your teacher will prepare some oxygen for you in the laboratory using manganese dioxide and hydrogen peroxide.
2. Keep the gas jar containing the oxygen tightly closed with a cover.
3. Light the wooden splint and allow it to burn for a short time.
4. Put out the flame.

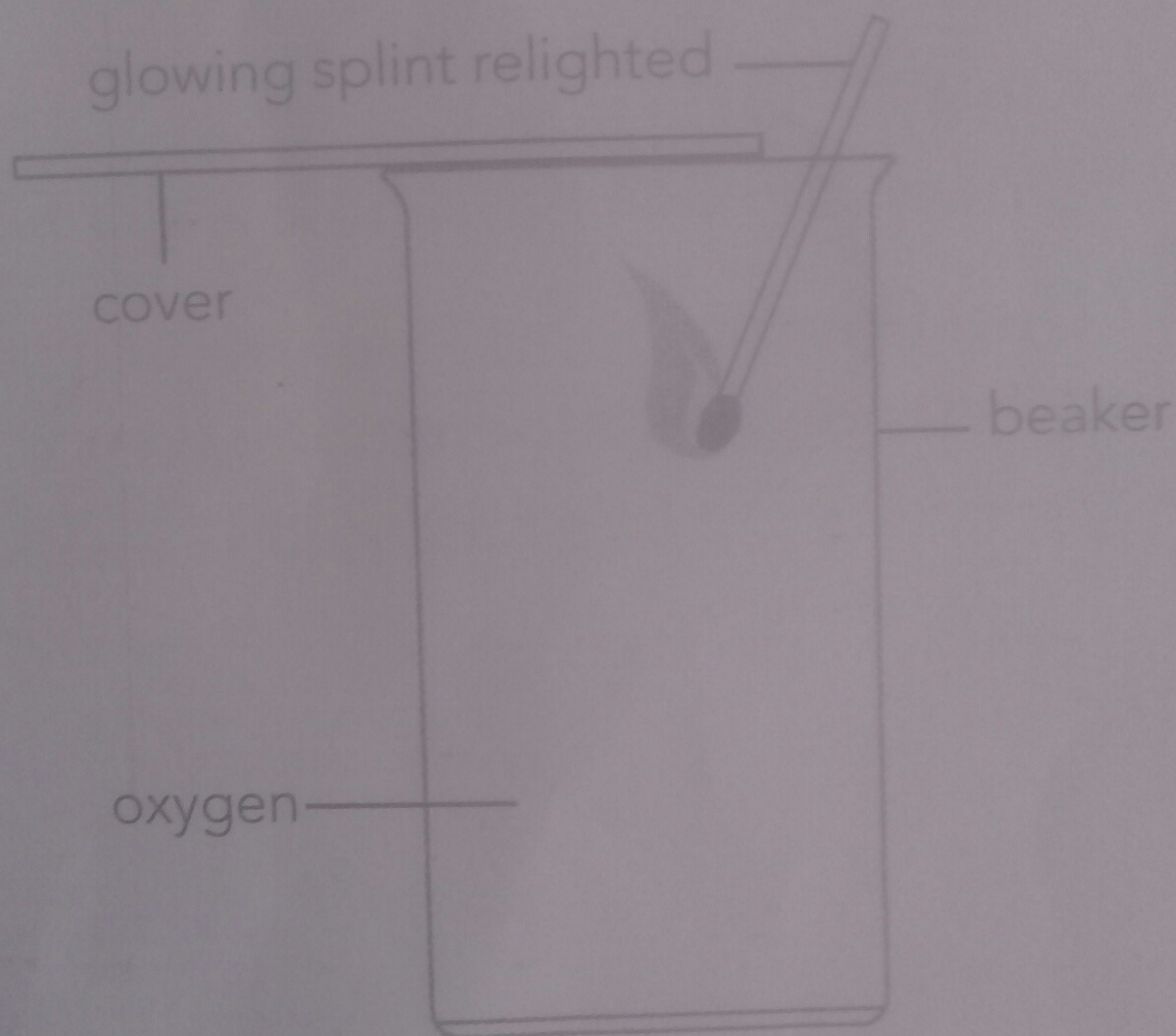


Figure 4.1 Testing for oxygen

1. While the splint is still growing, put it into the gas jar containing oxygen.
2. Quickly remove the splint and close the jar tight.
3. Put out the flame once more and put the glowing splint back into the gas jar.

RESULTS

- Oxygen relights a glowing splint.

CONCLUSION

- This shows that oxygen is present in the jar.

Questions

1. Describe what happens when the glowing splint is replaced in the gas jar containing oxygen.
2. Explain why the glowing splint relights in the oxygen in the gas jar.

CARBON-DIOXIDE GAS

- This is a gas produced when fuels burn.
- It is produced during respiration in plants.
- During respiration, glucose is broken down into carbon-dioxide, water and energy.

EXPERIMENT

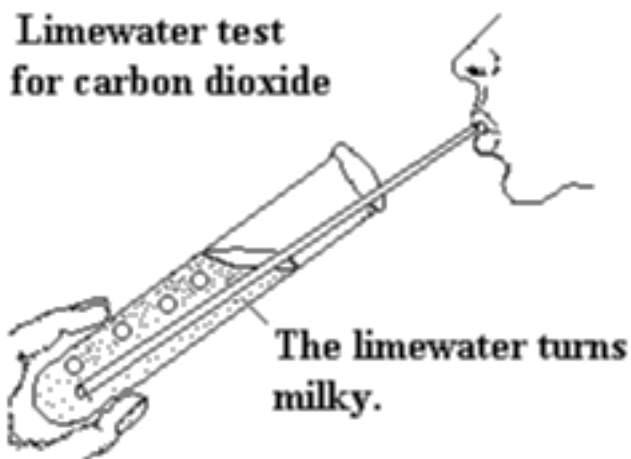
AIM: To test for the presence of carbon dioxide.

Materials

- Small beaker or test tube
- Drinking straw
- Lime water or bicarbonate indicator

Procedure

1. Pour 10ml lime water into each test tube or beaker.
2. Put the straw into the test tube.
3. Gently blow air from your through the lime.



OBSERVATION

- Record the colour changes as exhaled air bubbles through the lime water.

CONCLUSION

- Carbon dioxide turns lime water milky and the red bicarbonate indicator yellow.

Qstn: Using the information above, is carbon-dioxide present or absent in exhaled air?

EXPERIMENT

AIM: To compare inhaled and exhaled air.

Materials

- Test tubes
- Delivery tubes
- Corks with holes
- Lime water

Procedure

1. Set up the apparatus as shown in the picture below
2. Breath air in and out as shown.

Results

1. What do you observe in test tubes A and B?
2. Describe what happens when exhaled air passes through the lime water in test tube B only.
3. Does inhaled or exhaled air contain more carbon dioxide?
Explain your answer.

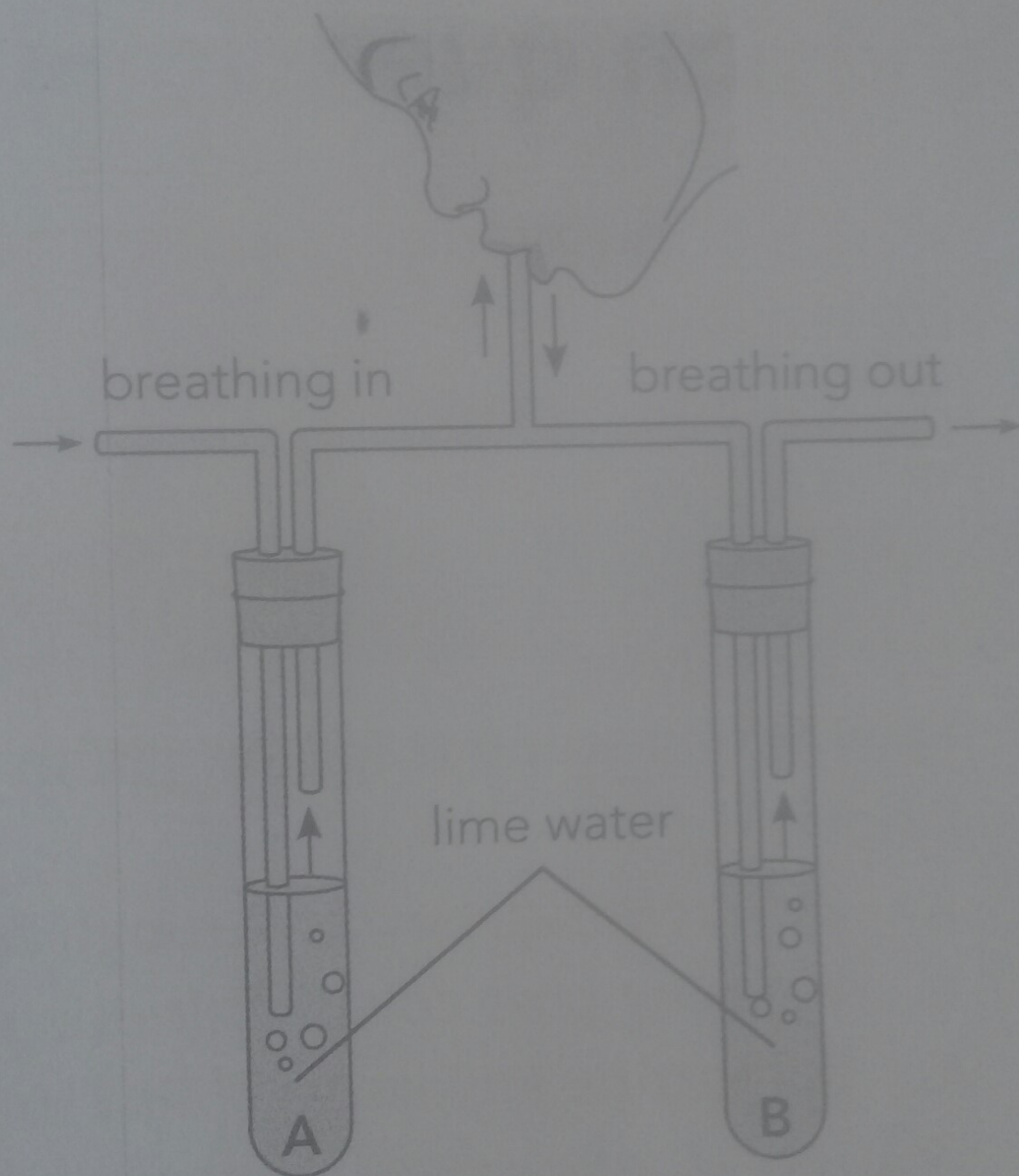


Figure 4.3 Comparing inhaled and

2. Breathe air in and out as directed.

Results

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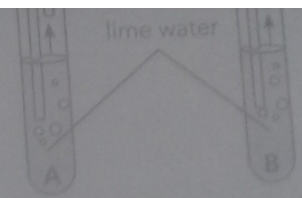
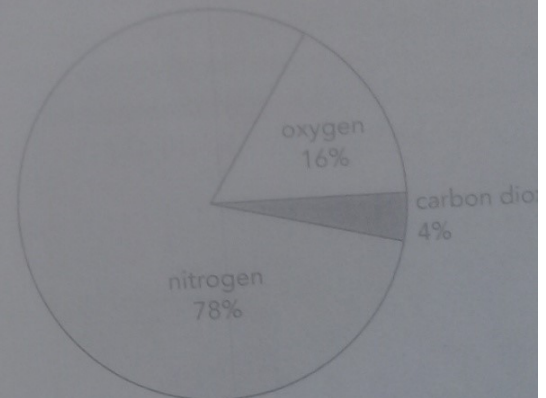
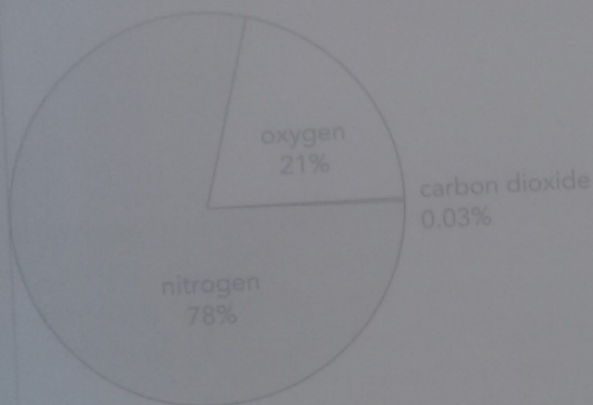


Figure 4.3 Comparing inhaled and exhaled air

In conclusion, the air that we breathe in contains more oxygen than the air we breathe out. We also

breathe out more carbon dioxide than we in. This is summarised in the pie charts below.



Summary

- Oxygen relights a glowing splint.
- Respiration is the process of burning food in our body cells to produce carbon dioxide and energy.
- Carbon dioxide turns lime water milky. It turns a red bicarbonate indicator yellow.

SUMMARY

- Oxygen relights a glowing splint.
- Respiration is the process of burning food in our body cells to produce carbon dioxide, water and energy.
- Carbon dioxide turns lime water milky. It turns a red bicarbonate indicator yellow.

Exercise

1. List the gases in order of increasing volume in air: oxygen, carbon-dioxide, nitrogen, rare.
2. What is the between inhalation and exhalation?
3. Name two gases involved in respiration.
4. What is the difference between breathing and respiration?
5. Describe how you would test for the following gases:
6. Oxygen
7. Carbon-dioxide