

12

Air around US



What

you will learn

Air

Does air have mass?

Properties of gases

The air is all around us. Although we do not see it we know it by its actions. Moving air or wind can move objects. When we hang our washing to dry we can see it flapping in the breeze (a light wind). Strong wind can move large objects and can cause damage.

A thick layer of air surrounds the earth. This layer of air is called the **atmosphere**. This protects the Earth from the harmful rays of the Sun and also prevents the Earth from getting too hot or too cold.

Air supports life!

What other ways is air useful?



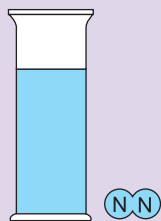
✦ The gases in the air

Air is considered a mixture because its composition varies and the gases in the air can be separated by physical methods.

Can you give another reason why air is considered a mixture?

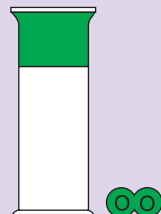
The main gases mixed together in the air are nitrogen, oxygen, argon and carbon dioxide. There are a few other gases, in tiny amounts.

Nitrogen

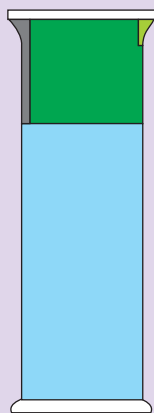


Colourless and odourless gas. Inactive and does not combine easily with other substances.

Oxygen



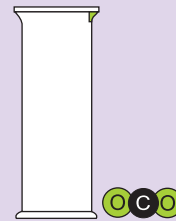
Colourless and odourless gas. Very active and readily combines with many substances to form new substances.



A gas jar of air

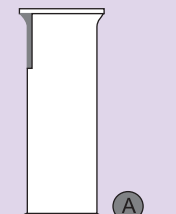
Colourless and odourless gas. Produced when living things respire.

Carbon dioxide



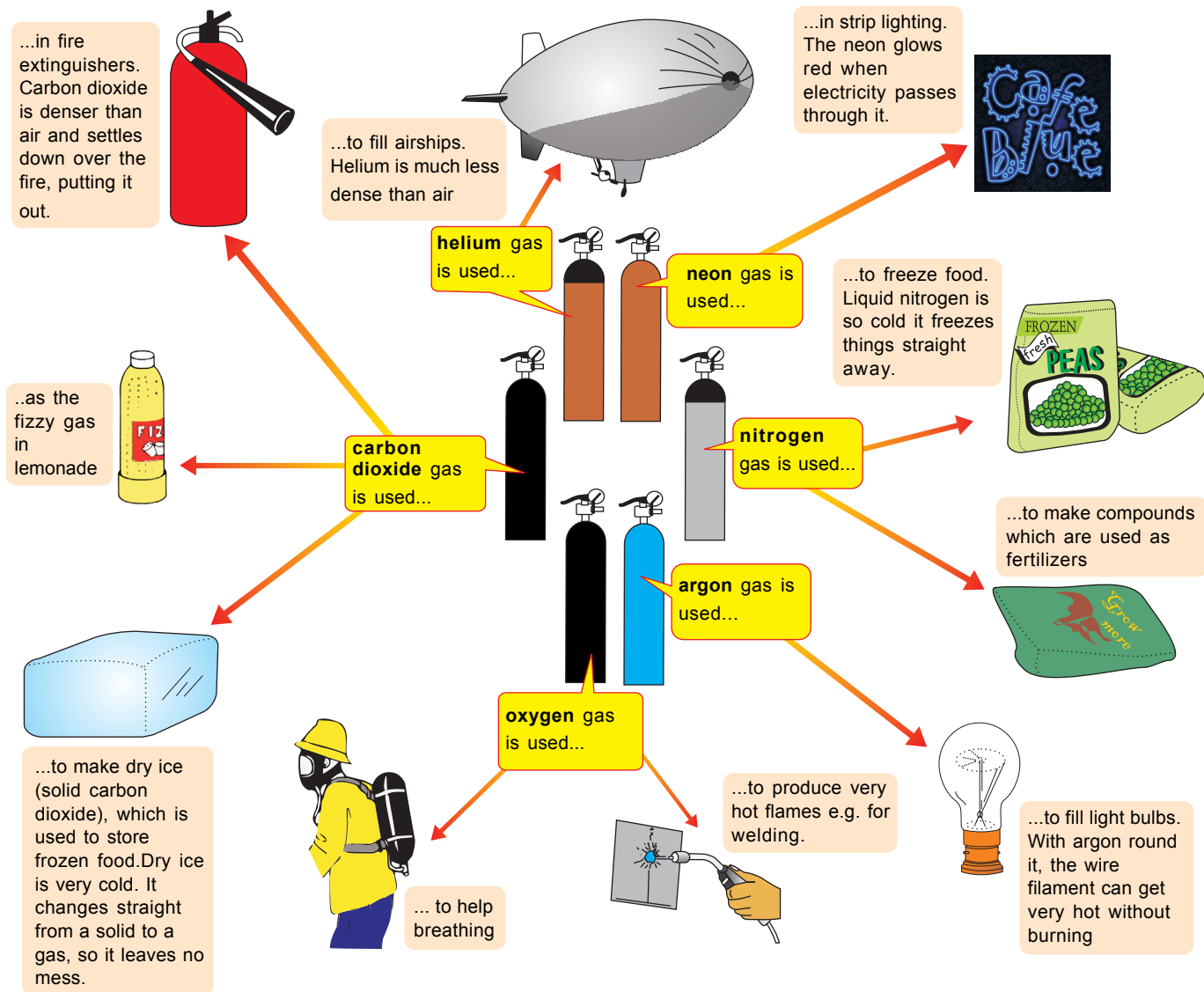
A group of very inactive or inert gases. Do not usually combine chemically with other substances.

Noble gases



Using the gases

The gases in the air are used for variety of purpose. For this reason gases are separated from each other and stored in cylinders. The cylinders have colour codes that tell you which gas is inside. Some of the few uses are:



- 1 Write down the composition of air by volume.
- 2 Why is air considered a mixture?
- 3 Our Moon has no atmosphere. Suggest how this affects
 - a the day and night temperatures of the Moon,
 - b the changes on the surface of the Moon.

Key Ideas

⇒ Clean air is a mixture of gases containing nitrogen, oxygen, carbon dioxide and noble gases.

⇒ Air supports life, allows fires to burn, and has many other uses.

Does air have mass?

Yes, it does. It just isn't very dense, so there isn't as much matter in a cup of air as there is in a cup of water. However, it does have mass, and you can calculate it too.



★ Lets calculate!

- Weigh an empty Ziploc bag or a balloon.
- Blow air into the bag or balloon and close it tightly.
- Reweigh the bag or balloon.
- What have you observed?



Have a variety of sizes of balloons and do a class graph on a poster. Students who do not believe air has mass, this shows them that it does.

★ Air occupies space

Take a deflated balloon and blow air into it so it is partly filled. What is in the balloon? Now, blow up the balloon until it is full. Is there more air in the balloon now than there was before? Obviously, air takes up space.

Do you Know?

One in four people worldwide is breathing air which is damaging their health.

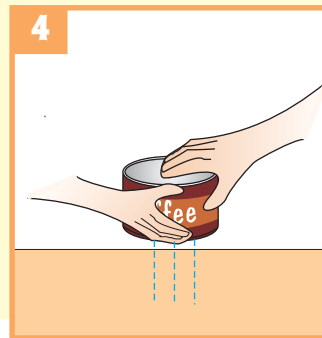
• Does air have pressure?

The pushing force of air is called air pressure. The closer you are to Earth, the greater the air pressure. The farther away from Earth (in other words the higher your altitude), the less the air pressure. And remember, pressure is coming from all around us.



• The magic can - a demonstration of pressure

- Take a coffee can and punch 3 small holes in the bottom.
- Also punch one hole in the lid.
- Now fill the coffee about 1/2 full of water and put the lid on.
- Place your hand over the hole and press down on the lid. Notice how the water streams out of the holes on the bottom due to the pressure you are exerting on the lid.
- Now slowly stop applying pressure to the lid. Notice how the stream of water stops.
- You can stop and start the flow of water simply by removing your finger from the hole.



?

- 1 What is happening with the magic can? see if you can come up with an explanation!
- 2 Think of some other way you could demonstrate that air has pressure?
- 3 Think of some other method to show that air has mass.



Ideas

- Although we cannot see air, it has mass.
- The pushing force of air is called air pressure.
- Air pressure is less in high altitude.

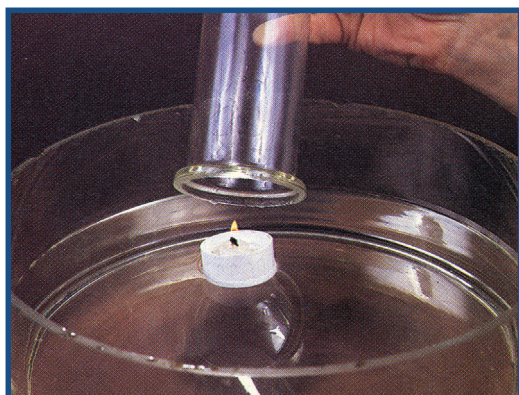
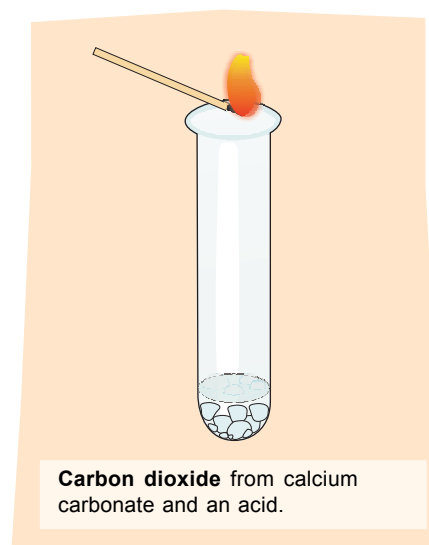
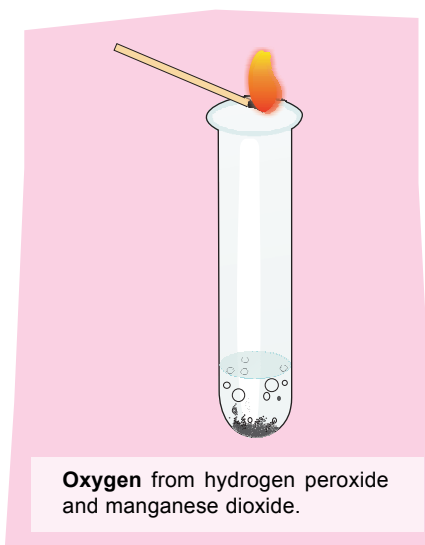
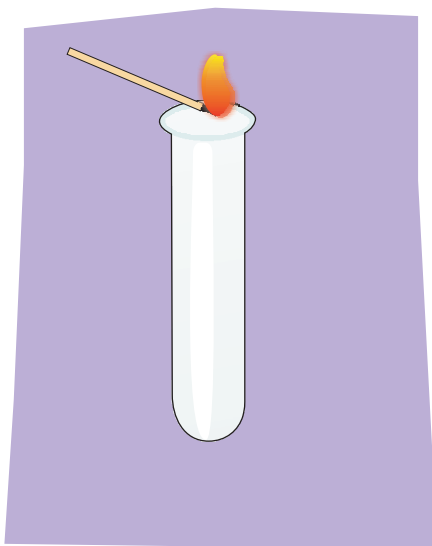
Properties of gases

NITROGEN	OXYGEN	CARBON DIOXIDE
Colourless and odourless	Colourless and odourless	Colourless and odourless
Inactive; does not combine readily with other substances	very active; combines readily with many substances	Inactive

✦ Gases! Are they really there at all?

Some gases are easy to make.

Try putting a burning wooden splint into each of these tubes of gases to compare what happens.



What do you think is left in the cover jar at the end?
How could you test your ideas?

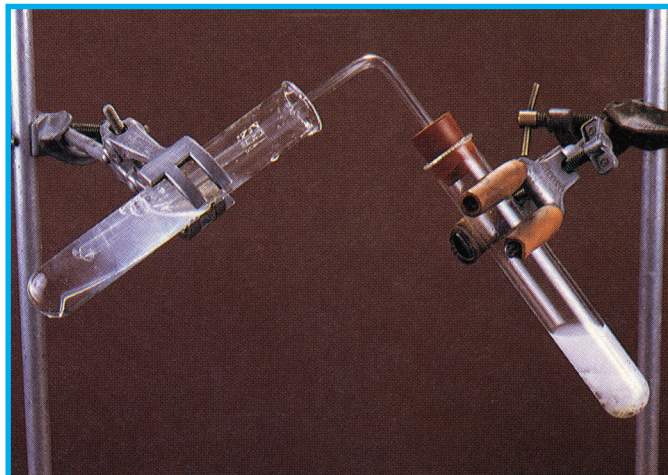
Do you Know?

The highest recorded air temperature at an official reporting station was 58°C at Al'azizyah, Libya.

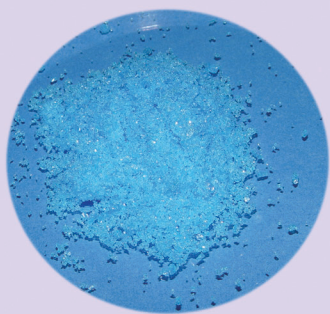
• The carbon dioxide test

You already know the glowing splint test for oxygen. Here is a test for carbon dioxide.

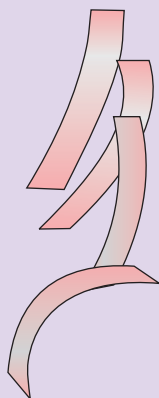
When you add acid to calcium carbonate, gas is produced. If you let the gas bubble through limewater, you should see a change. What happens to the lime water?



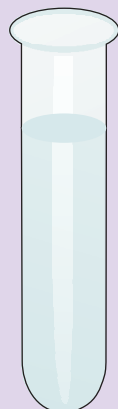
• The water test



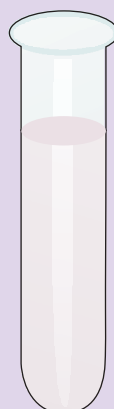
dried copper sulphate



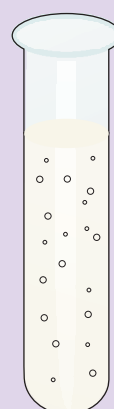
cobalt chloride papers



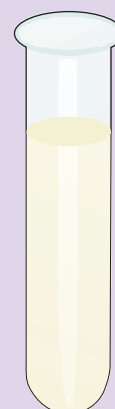
water



paraffin



lemonade



cooking oil

- Put some dried copper sulphate powder or cobalt chloride paper in each tube.

What colour does the powder or paper in the tube containing water go?
Do any of the liquids in other tubes contain water?



- 1 You are given a test tube of oxygen gas and a test tube of carbon dioxide gas. How can you identify them?
- 2 The humidity in the air tells us how much ----- there is in the air.
- 3 The footprints left by the astronauts, Neil Armstrong and Edwin Aldrin on the Moon in 1969 are still there today. Can you explain why?



Ideas

- ⇒ Oxygen is present when a glowing splint relights.
- ⇒ Carbon dioxide is present when limewater turns milky.
- ⇒ Water vapour is present when cobalt chloride turns blue.

OMAR AL-KHAYYAM

1038 - 1048



Ghiyath al-Din Abul Fateh Omar Ibn Ibrahim al-Khayyam was born at Nishapur, the provincial capital of Khurasan around 1044 A.D. (c. 1038 to 1048).

He was a mathematician, astronomer, philosopher, physician and poet. He is commonly known as Omar Khayyam.

Little is known about his early life, except for the fact that he was educated in Nishapur and lived there and in Samarqand for most of his life.

He did not like to be employed at the King's court and led a calm life devoted all his time for knowledge. He traveled to the great centers of learning, Samarqand, Bukhara, Balkh and Isphahan in order to study further and exchange views with the scholars there. While at Samarqand he was patronized by a dignitary, Abu Tahir.

Algebra would seem to rank first among the fields to which he contributed.

The Saljuq Sultan, Malikshah Jalal ad-Din, called him to the new observatory at Ray around 1074 and assigned him the task of determining a correct solar calendar.

Khayyam introduced a calendar that was remarkably accurate, and was named Al-Tarikh-al-Jalali. It had an error of one day in 3770 years and was thus even superior to the Georgian calendar (error of 1 day in 3330 years).

Apart from being a scientist, Khayyam was also a well-known poet.