

Gassy skies

Our planet is surrounded by an invisible cloak of gases that we call the atmosphere. It is the atmosphere that gives us the air that we breathe and protects all life on Planet Earth.

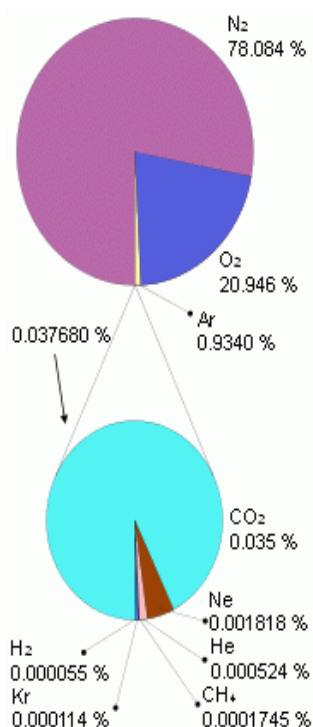
The atmosphere is held to the Earth by the force of gravity.

Question

Can you find out how the atmosphere protects us from space?



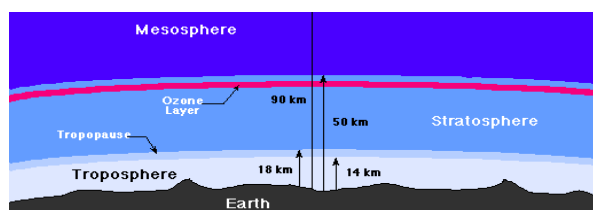
Image: NASA



What's in our atmosphere?

The Earth's atmosphere is made up of many components. While oxygen is the second most abundant gas in the atmosphere, it wasn't always this way. It was from about 3.5 billion years ago that oxygen was slowly added to the air.

Work with your teacher to produce a timeline of how oxygen reached its present levels in the atmosphere.



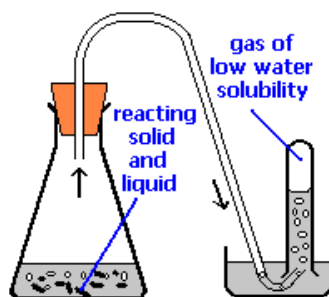
The atmosphere reaches approximately 600 kilometres above the surface of the Earth.

However, about three quarters of the atmosphere is within 11 kilometres of the surface and gradually thins out as we head up.

How to test for oxygen in the classroom

One of the most common tests for oxygen in the laboratory is the glowing splint test.

To prepare oxygen in the classroom you can use the water displacement experiment. Because all gases are less dense than liquid water, they will displace the water downwards.



What you do...

1. Secure the neck of a 250 ml conical flask with a clamp to make sure it will not fall over
2. Insert a glass tube into a single-hole rubber stopper that fits the flask
3. Attach one end of some rubber tubing
4. Fill a gas jar with water and cover it with a glass plate or tile (a test tube can be used to collect smaller amounts of oxygen)
5. Half fill a water trough and invert the gas jar into the water
6. Carefully remove the glass plate or tile, keeping the mouth of the gas jar below the water level in the tray
7. Place 150 ml of hydrogen peroxide into the flask
8. Measure out 5 grams of manganese dioxide
9. Add the manganese dioxide to the flask and quickly insert the stopper/hose assembly into the flask's mouth
10. Take the free end of the rubber hose and insert this end under the mouth of the gas jar. As the oxygen bubbles up, it will displace the water from the gas jar or test/boiling tube
11. With the bottle inverted and still in the water, place the glass plate or tile over the mouth. You can now remove the jar – you have now prepared oxygen for testing!

Did you know? Why do stars twinkle, as in the nursery rhyme "Twinkle, twinkle little star"? It's due to the way our atmosphere churns and refracts their light, sending it in different directions. This makes the stars' brightness and positions seem to change a little. A good way to work out if you are looking at a planet and not a star is that the planet does not twinkle or (as astronomers say) "scintillate". Can you find out why?

Safety advice

Be sure to observe the laboratory safety rules in your school!

If the flask reaction slows down or stops, swirl the contents gently or repeat steps 7 to 9

Your teacher may suggest other methods and chemicals to prepare oxygen. Try these out to see which produces the most bubbles, speed of water displacement etc. Record and discuss your findings.

Try this!

Ask your teacher about other experiments using oxygen in the lab, for example how it reacts with metals such as magnesium or steel wool

Once you have collected the oxygen you can test for its presence by inserting a glowing splint into the test tube. If oxygen is present it should reignite the splint. Work with your teacher to see if you can prepare and test for any other gases in the atmosphere.



How to make your own clouds

We are all used to clouds and rain in the atmosphere over Ireland – here's how to make your own clouds in the chemistry lab.

What you need

- A 2 litre plastic bottle with a screw-top lid
- Match or lighted splint to create smoke
- Water

What you do

1. Using a small beaker, place some water into the bottle
2. Light the match or splint and blow it out. Quickly hold it inside the bottle to make the smoke
3. Put the lid on the bottle and gently shake.
4. Squeeze the bottle several times and observe what happens inside.

Then try varying the amounts and temperature of water and record the results. Discuss your findings with your classmates and see if you can work out the different factors needed to make the best clouds.

Other atmospheres

The Earth is only one planet of our Solar System, and many of these other planets have atmospheres made up of different amounts of gases.

Work individually or as part of a team to investigate the other planets in our Solar System and discuss what you have found out about their atmospheres.

Questions you could ask

- Do all planets have atmospheres?
- What are the atmospheres made of?
- Would we be able to breathe in the atmosphere on another planet?
- If a planet has a very thin atmosphere, would this make the planet's surface temperature very hot, or very cold?

