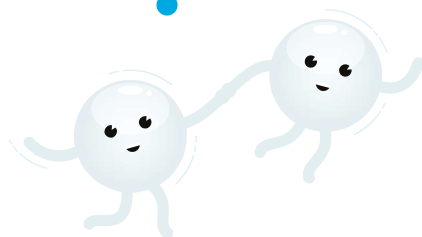


1. Gas bingo

Introducing the gases in air



Overview

Use the bingo machine with a customised set of bingo balls to show the different gases that make up the air around us.

What's happening?

Air is a mixture of different gases, the main components are nitrogen (78%), oxygen (21%) and argon (0.93%). This demonstration shows the proportions of these gases in the air using a bingo machine. The blue balls represent nitrogen, the red balls show oxygen, and the one pink ball shows argon. We are also showing carbon dioxide, which is actually only 0.04%, with a single black ball.

Why is this important?

Take a deep breath! Gases are everywhere around us, including in the air that we all breathe. This demonstration helps our understanding of what air is. When the balls are bouncing around inside the bingo machine, this is a visual representation of the moving molecules in the air around us. It also shows that air is a mixture of different gases. Each of the gases that are in the air have different uses in industry, and potential uses in the future.

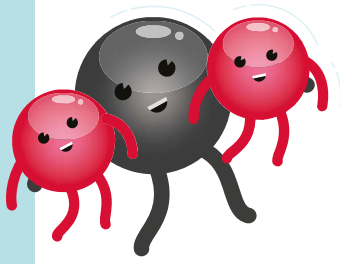
For example, nitrogen is used in the food industry and to make agricultural chemicals, and carbon dioxide is used in carbonated drinks and is also an example of a greenhouse gas (see 'Absorbing heat' activity and 'Further Ideas and Information'). It is also important to show that all these gases occur naturally in the air we breathe, and are a normal part of human, animal and plant respiration.

More stories to tell

Where did the air come from?

Recent evidence suggests that most of the Earth's atmosphere actually may have come from outer space, not from early volcanoes as previously thought. The Earth was bombarded by comet-like meteors that carried water and gases to our young planet billions of years ago, before the solar system was fully formed.





“The amount of water vapour in the air can vary from day to day”

Is there anything else in the air?

As well as the four gases shown in the bingo machine, a small amount (about 0.002%) of the air is comprised of other stable gases such as neon, helium, krypton and xenon. There is also a miniscule amount of hydrogen. As well as all these elemental gases, air pollutants and greenhouse gases such as particulate matter, ozone, methane and water vapour exist in the air and vary in proportion depending where you are.

Do the proportions of gas in the air ever change?

The ratio of nitrogen, oxygen and argon in the air is the same from sea level to the highest mountains. However, at altitudes above about 2400 metres, the thinner atmosphere and lower air pressure means it is harder to breathe in enough oxygen and a person who is not acclimatised may experience symptoms of breathlessness and altitude sickness.

The amount of water vapour in the air can vary from day to day and from place to place. Warm air can hold more water than cold air. In a rainforest, the air can contain up to 6% water vapour.

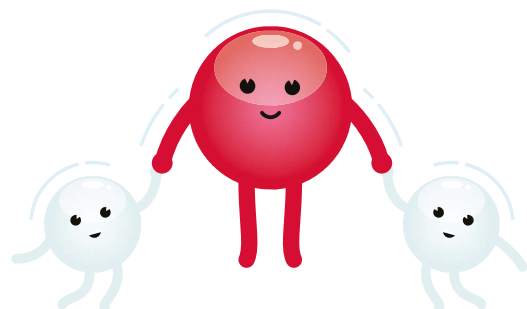
The types of gases in the atmosphere and their relative proportions have changed a great deal over the history of the Earth. On a shorter timescale, over the past 100 years the concentration of carbon dioxide has increased from 0.003% to 0.004%. Human activities that contribute most to this increase include burning fossil fuels for electricity, transport, food production and the manufacture of industrial materials

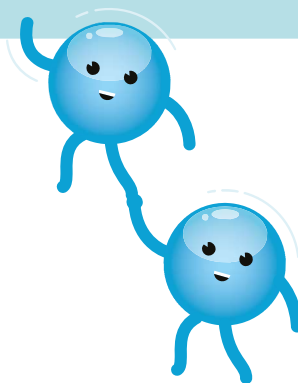
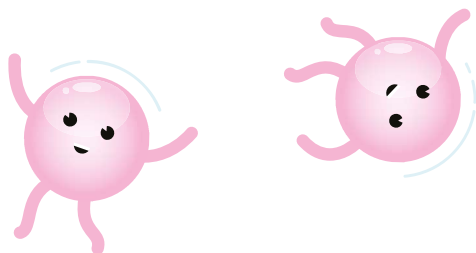
such as cement. Deforestation also contributes to this increase as it reduces the amount of carbon dioxide taken from the atmosphere (see ‘Capturing carbon dioxide’ activity).

The Activity

This is an interactive demonstration. Preload all of the bingo balls into the bingo machine (there are 101 balls). Once loaded, the machine is operated by a crank handle, which a volunteer can turn. You can also ask the audience to name the different gases as they move around inside the machine, or as they come out of the chute. It should be made clear that the blue balls make up the majority of the total balls, demonstrating that nitrogen makes up the majority of the air.

The demo can be run as a game of ‘Gas Bingo’, where the audience guesses which ball will come out next. If you are feeling brave, let the ball that comes out dictate which part of the show you move on to, using the machine as a recurrent theme throughout the show.





Maintenance

The mechanism is turned by a handle, which can come loose if turned vigorously. Please ensure the handle is screwed on tightly and take care when it is being used by over-enthusiastic volunteers. It needs to be turned clockwise for the balls to come out of the chute.



Health and Safety



Every delivery centre must undertake their own risk assessments for the specific audiences, locations and conditions they are presenting in. Sample assessments are available on The Secret World of Gases website. Below is a guide to the key risks and hazards:

1. The bingo balls may present a choke hazard, so keep them away from children.

2. Make sure that fingers don't get stuck in the spinning bingo cage. This is particularly important if using children as volunteers for this section.

3. Prevent bingo balls spilling on the presentation floor as they will be a slip and trip hazard.

SECRET GAS FACT

Mountaineers have to carry tanks of oxygen to climb very high mountains. Above about 8000 metres the human body cannot acclimatise and there is not enough oxygen available to breathe. This is termed by mountaineers 'the death zone'.

