

STARDOME OBSERVATORY & PLANETARIUM FACTS, RESOURCES AND ACTIVITIES ON...

A HAVEN FOR LIFE

WHY EARTH'S ATMOSPHERE IS SPECIAL

Atmospheres play a vital role in what a planet is like, and they give us things like weather and climate. Not only is Earth's atmosphere essential for us to breathe, its unique composition and thickness allows liquid water to exist on the surface.

Our neighbours, Venus and Mars, were once thought to hold oceans of water much like Earth. However, due to these planet's atmospheres, the outcome of these oceans are radically different to Earth's. Venus got too hot and Mars got too cold. Earth stayed somewhere in the middle, becoming a haven for life.

Unfortunately, humans have been slowly changing the climate and atmosphere by burning fossil fuels and adding carbon dioxide (CO₂) to our atmosphere. CO₂ acts as an insulant, trapping heat, known as the greenhouse effect. It is essential for our planet, but too much will cause Earth to dramatically change.

Venus shows what too much CO₂ can do to a planet. The Venusian atmosphere is 96% CO₂, making it the hottest place in our Solar System. Heat from the Sun is trapped in the thick blanket of CO₂. Unable to escape, Venus got hotter and hotter over eons. The average temperature of present day Venus is over 460°C, day or night! Any oceans that once existed on Venus were boiled away because of this run-away greenhouse effect. In comparison, Earth's atmosphere is only made up of 0.04% CO₂.

Mars suffered a very different fate. Like Venus, Mars also had oceans some 4 billion years ago. The atmosphere was stripped away over time from solar wind. It eventually did not have enough atmosphere and CO₂ to trap any heat and the pressure dropped. The oceans then

Venus today is a hot, inhospitable world.

Credit: ESA



Mars' about 4 billion years ago would have looked strikingly similar to Earth today. Credit: ESO



CO₂ is essential for Earth but too much of it will cause the planet to overheat

boiled away from the lack of atmosphere.

Water boils at different temperatures depending on how thick a planet's atmosphere and pressure is. On Earth, water boils at 100°C at sea level. At the top of Mt Everest, it boils at about 68°C. Mars' atmospheric pressure became too low for any water to exist in large bodies, and it turned into the dry, barren planet we know today.

CO₂ is important for Earth trapping heat and regulating our temperature. However, too much of it will have hugely negative impacts on how we live. It's important that we take care of Earth and that we make sure it always stays the haven for life that it is today for future generations.

Why is a planet's atmosphere so important?

If we put too much CO₂ into Earth's atmosphere, what could our future look like?

What makes Earth's current atmosphere so special?

DISCUSSION POINTS

Check out these other resources...

climatekids.nasa.gov/
kidsgeo.com/earth-geography/



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ACTIVITY

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THE GREENHOUSE EFFECT

WHAT YOU'LL NEED:

- Three jars of the same size
- Lids to close two of the jars
- Three thermometers
- Water
- Direct sunlight
- Paper and pens to record the changes and results

WHAT DO TO:

- 1 Put 1 thermometer in each jar.
- 2 In the first jar, leave this open and mark it with 'no greenhouse'.
- 3 On the second jar, close the lid tightly and mark it with 'greenhouse'.
- 4 In the third jar, fill it up with a small amount of water and close the lid tightly. Label this jar 'greenhouse with ocean'.
- 5 Record the temperatures of all three jars on paper. They should all be the same to start with.
- 6 Place each of the jars in direct sunlight, so each receives the same amount of light.
- 7 Leave the jars for a few hours, ensuring they all stay in direct sunlight.
- 8 After an hour or two, check each jar and record the temperatures of each.

WHAT HAPPENS?

Each of these jars should show different temperature readings, despite each getting the same amount of Sun and light.

The 'no greenhouse' jar should show the lowest temperature. This is because the jar has nothing to insulate and trap heat due to not having a lid on. This is what would happen to Earth if we did not have an atmosphere that helps us trap heat. We would become a cold planet.

The 'greenhouse' jar should show a higher temperature than the first. The lid simulates an atmosphere, as it helps trap heat and keep the jar warmer than the first.

The 'greenhouse with ocean' jar should show an even warmer temperature, and it's likely that the glass will have fogged over. Water is a lot better at holding heat than air, and it will stay warmer for longer once you open the jar. Oceans on Earth absorb heat and help to regulate temperatures. Condensation in real life is what we know as clouds.

YOUNGER KIDS?
HERE'S A BUNCH OF
AWESOME, EASY EXPERIMENTS:
www.asme.org/career-education/articles/k-12-grade/5-ways-to-demonstrate-air-pressure-to-children



OLDER KIDS?
TRY OUT THIS EXPERIMENT,
WHICH DEMONSTRATES ATMOSPHERIC
PRESSURE AND ITS EFFECTS:

www.stevespanglerscience.com/lab/experiments/why-does-the-water-rise/

All three of these help us understand why the greenhouse effect is important to Earth. If we did not have an atmosphere with CO₂, Earth would become very cold. If we have too much, Earth will continue to heat up and our environment will drastically change. It's important that we protect our home and ensure that our planet does not heat up by adding too much CO₂ to our atmosphere.



TAKE A PHOTO OF YOUR ACTIVITY AND SEND IT TO US.
WE'D LOVE TO SEE IT! EDUCATION@STARDOME.ORG.NZ

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