Keep Scotland Beautiful

Eco-Schools

Climate Action Week 2022

Greenhouse effect experiment – notes to educators

The following experiment is a simple way for pupils to test the effect that the excess of man-made greenhouse gases is having on the temperature of the planet.

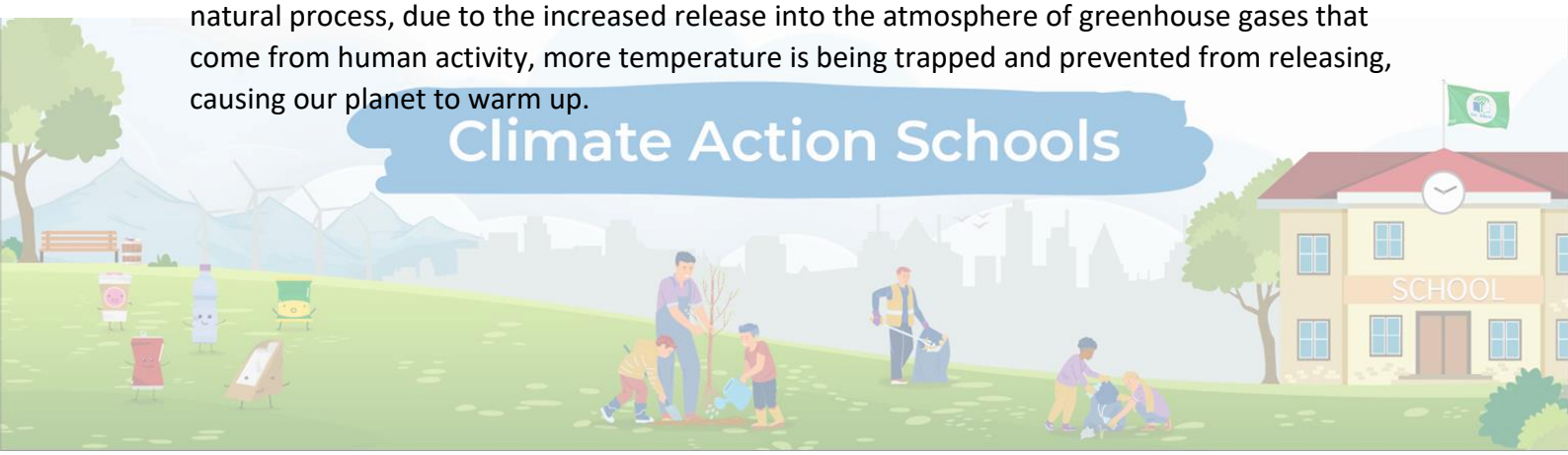
Key concepts ahead of the experiment:

Climate change: our planet has experienced changes in its regional and global climate patterns and average temperatures throughout its history. These changes are normal and have tended to be cyclic. They have involved periods of cold temperatures and glaciation, and periods of warmer temperatures. 'Climate change' is the term used for describing these changes in the average conditions in a region over a long period of time. Despite climate change being a natural process, over the past decades scientist have been reporting unusual changes in the Earth's climate patterns, with a faster increase in the planet's average temperature and higher unpredictability of weather patterns. These changes have been linked to human activity.

Global warming: the term that describes the unusually rapid increase in our planet's average surface temperature over the past century, primarily linked and caused by the greenhouse gases released by human activity, particularly through burning fossil fuels.

Greenhouse gases: the general name for certain gases present in Earth's atmosphere which have the property of trapping heat. These gases allow the sunlight pass through the atmosphere towards the surface of our planet, but prevent the heat that comes with sunlight from leaving the atmosphere. The main greenhouse gases are: water vapour, carbon dioxide, methane, ozone, nitrous oxide and chlorofluorocarbons.

Greenhouse effect: it is the name for the natural process through which the energy from a source (like the sun) gets trapped near the surface of the receptor (like our planet), and is prevented from escaping. In our planet's case, it is thanks to our atmosphere and the gases that form it that the greenhouse effect takes place, and life can subsist. If it weren't for this, our planet's average temperature would be below zero. Despite the greenhouse effect being a natural process, due to the increased release into the atmosphere of greenhouse gases that come from human activity, more temperature is being trapped and prevented from releasing, causing our planet to warm up.



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Description of activity:

This experiment can be carried out in groups or one for the whole class.

Materials you will need per experiment:

- Two identical glass jars.
- One thermometer.
- Cold water (same amount for each jar).
- One clear plastic bag (which will reproduce the greenhouse effect in one of the jars).
- Pen and paper to register temperature readings.
- A sunny windowsill for placing the experiment.

Before the experiment:

Ask pupils about their understanding of the key concepts and what do they think the experiment will show. Ask pupils what they think the plastic bag will be used for and what they expect to see happening.

Experiment:

- Fill both jars with the same amount of water.
- Measure and record the initial temperature of the water in each jar.
- Wrap one of the jars with the plastic bag. This jar will be the one with a 'greenhouse gas effect' on it.
- Leave both jars on a sunny windowsill.
- Measure and record the temperature of the water during the day, for example at intervals of 1 hour.

Results and discussion of conclusion:

Ask pupils what they expect to see happening during the experiment and why.

The jar with the plastic bag on should show higher temperature than the other one. This is because the plastic bag acts as an insulating layer that traps some of the heat of the sunlight, which builds up the temperature, just like the atmosphere does through greenhouse gases.

Extension: what would happen if we increased the number of plastic bags or layers? What would happen if at the start of the experiment we add an ice cube to each jar? (Note: ice cubes should have the same size.)

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