forscherwelt
A Henkel initiative

Greenhouse gas effect

Greenhouse gas effect

Influence of CO_2

Carbon dioxide and global warming

The greenhouse gas effect is caused by gases in the Earth's atmosphere trapping heat from the sun. Without the Earth's atmosphere, the planet would be much colder. Carbon dioxide (CO_2) is one of these natural gases – it is part of our air. We exhale CO_2 with every breath we take. In addition to natural sources, CO_2 is produced by all kinds of combustion processes. Car exhaust fumes, for example, consist largely of CO_2. Man-made greenhouse gases are the main cause of climate change. You can investigate the greenhouse gas effect caused by CO_2 with this experiment. Let's measure the greenhouse gas effect of CO_2 in an experiment.

You will need:

Greenhouse gas (CO_2) Source :

CO_2 is released when lime (calcium carbonate) is given an acid such as vinegar. As soon as the vinegar hits the lime, it starts to bubble. The bubbles are CO_2. As an alternative to lime, you can also take effervescent tablets or baking soda.

Heat source (which represents the sun)

We use a bright lamp as a heat source. Caution - do not touch the lamp when it is on.

Greenhouse (atmosphere)

We use two glass vessels (Erlenmeyer flasks).

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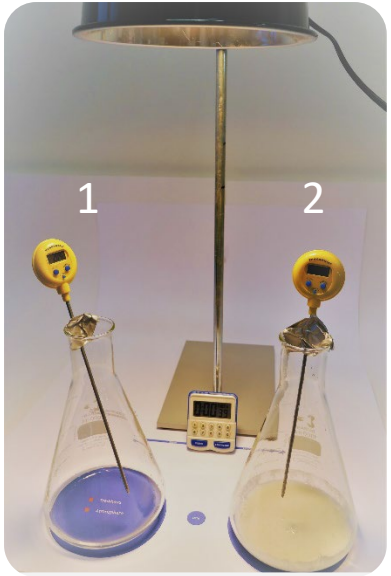
Measure the effect

1. Attach the digital thermometers to two glass jars (jar 1 and jar 2) using adhesive tape. The tips of the thermometers should be 5 cm above the bottom.
2. Place the jars 5 cm apart.
3. Weigh out 10 g of lime and pour the lime into jar #2.
4. Measure the temperature in the two jars and record the temperature values in the table below.
5. The temperature in both vessels should be about the same at the beginning.
6. Attach a lamp to a stand so that it is about 35 cm above the table. Position it so that it shines evenly on the two jars.
7. Switch on the lamp.
8. Carefully pour 50 ml of vinegar into the glass with the lime.
9. Start the stopwatch and measure the temperature every 2 minutes. Record the temperatures you measure in the table.



Caution: The lamp becomes very warm! Keep your distance from the bulb!

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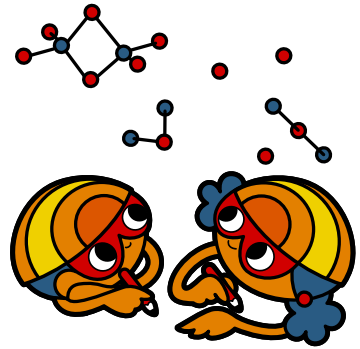
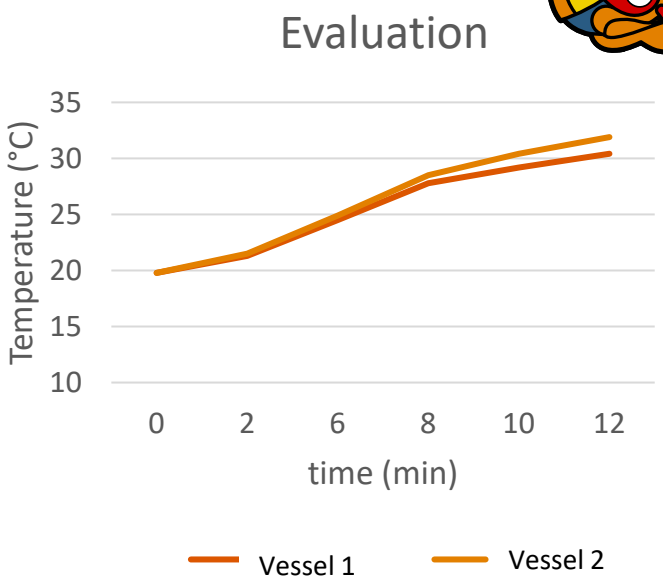
Evaluation

Time (min)	Temperature vessel 1 (w/o CO_2) (°C)	Temperature vessel 2 (with CO_2) (°C)
0		
2		
6		
8		
10		
12		





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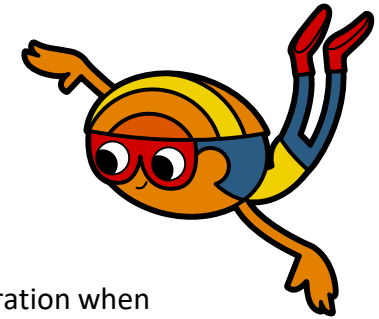
Further information for parents and teachers



In order to be able to measure the effect as well as possible, a few points must be taken into special consideration when setting up the apparatus:

- The set-up must be symmetrical, i.e. the beakers and thermometers must have the same distance to the lamp.
- The initial temperature in both vessels should be as equal as possible; this can be achieved, for example, by preparing the apparatus the day before so that the objects have time to adjust to the room temperature.
- The apparatus should be placed in a location that is as protected from the wind as possible; any drafts in the room, e.g. from an air conditioning system, will interfere with the measurement.