

Global Precipitation Measurement Mission

Name: _____ Date: _____ Period: _____

Climate Change Inquiry Labs: CO₂ and Air Temperature

Lab Instructions

Carbon dioxide is a trace gas that has existed in our atmosphere for billions of years. Scientists were not around then to measure the small amounts of CO₂, but past CO₂ levels can be accurately measured by using ice core samples from glaciers. The gas was trapped in the glaciers as the glaciers formed. The CO₂ levels are measured in parts per million. Carbon dioxide is released to the atmosphere when fossil fuels and other hydrocarbons are burned. Also, carbon dioxide is released through animal respiration. Recently, the highest levels of carbon dioxide on record have been observed. What effect will carbon dioxide have on temperature?

Text adapted from http://wupcenter.mtu.edu/education/Global_Climate_Change/lessons/Paul_Wilson_Green_House_Effect-%20Lab.pdf

Objective: Students will investigate the effect of simulating the addition of carbon dioxide (and other greenhouse gases) on temperature.

→ NOTE: The plastic wrap is representing carbon dioxide in the model used for the experiment. Greenhouse gases don't hold in heat exactly the same way as the plastic wrap, but using various methods of adding actual carbon dioxide doesn't produce consistent results in the small scale.

Hypothesis: I think that simulating adding carbon dioxide and other greenhouse gases to the air will cause the temperature in a container to _____.
(increase, decrease, or stay the same)

I think the temperature change will be _____ degrees different than the container without simulated greenhouse gases.

Materials

Beaker or clear plastic container (two)

Thermometers or temperature probes (two)

plastic wrap and rubber band or string

tape

Procedure

1. Tape the thermometers into the beakers or other containers, making sure you can read the temperature easily. If you are using lightweight plastic cups, it may help to tape them down the table for stability.
2. Put the containers into sunshine. Make sure they receive the same amount of sun. NOTE: A heat lamp may be substituted for the sun, but you must be careful to place the containers the same distance from the lamp, and beware that the bulb and shade may get quite hot.
3. Record the temperature of each bottle after about 30 minutes.

→ While you're waiting, complete the questions on the back of the paper.

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	Starting temperature	After _____ minutes	Change in temperature
Regular air			
Air with simulated CO ₂ (covered with plastic wrap)			

After the experiment: Was you hypothesis supported by the data? _____

Explain why this might be the case. _____

References: Glory and Global Warming Experiment. <http://glory.gsfc.nasa.gov/globalwarmingexperiment.html>
Astro-Venture Greenhouse Gases Modeling Activity. <http://astroventure.arc.nasa.gov/teachers/pdf/AV-Atmoslesson-3.pdf>

→While you're waiting for the experiment, calculate your Personal Climate Footprint on the following website: http://www.footprintnetwork.org/en/index.php/GFN/page/personal_footprint/

How many planets worth of resources would it take if everyone lived like you? _____

What are the two largest areas on the pie chart of your Ecological Footprint? _____

How many acres of Earth's productive area would it take to support your lifestyle? _____

→Choose the button to "explore scenarios" and select one "What if...?"

What would you choose to do to reduce your carbon footprint? _____

How much would that reduce the number of Earths needed to support everyone at your lifestyle? _____

Compare this carbon footprint with that calculated from a different website, <http://www.nature.org/greenliving/carboncalculator/index.htm>.

What are some differences and similarities you notice? _____

