

Bringing the Greenhouse Effect Down to Earth

Purpose

To compare the amount of Carbon Dioxide (CO₂) found in four different sources of gases.

Teacher's Lab Notes

Students will be filling balloons with pure carbon dioxide, exhaled air, and ambient air. For safety reasons, you should fill the balloons with automobile exhaust yourself. Wear thick gloves to protect your hands from being burned. Fill the balloons in an open area where there is a slight breeze blowing to keep the exhaust gases away from your face. Place a balloon over the narrow end of a cardboard funnel and place the wide end of the funnel over the exhaust pipe of a running car. When inflated, the balloon should be about 7.5 cm in diameter. However, it may be easier to first over-inflate the balloon and then let a little gas escape. Once the balloon is inflated, twist and tie the end. Repeat the procedure with the same color balloon until you have one for each lab group.

The ambient air solution in vial A will not turn yellow. The level of CO₂ in ambient air is too low to affect bromthymol blue.

Students will need around 60 drops of the diluted ammonia to neutralize the solution in vial D (vinegar-baking soda reaction). The other two vials should require between 7 and 40 drops. Caution students to add the drops slowly and shake the solutions between drops. This will ensure that they get a careful record of when the color changes back to the same color blue as the control.

Because the students will have to add a relatively large amount of ammonia to the solution in vial D, the color of this sample may be affected by dilution. To equalize this effect, you may want to have students add some water to the other samples to make the volume in each sample equal. This is easiest to do if sample D is titrated last.

Post Lab Discussion

Make a chart on the board to pool each group's results. You may want to discuss the following questions:

- Which samples had the most and the least carbon dioxide?
- Why didn't the ambient air sample turn yellow? (The test isn't sensitive enough to detect low concentrations of CO₂.)
- Carbon dioxide is a natural part of our atmosphere, but too much CO₂ could make the Earth warmer through an increased greenhouse effect. Why is automobile exhaust a concern?