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Is it Getting Warm in Here? Ecology – Carbon Cycle

Completion Time: 40 – 50 minutes

Materials Needed: 3- Thermometers, calibrated with each other
3- Plastic food containers, clear with sealable lids
2 cubic cm- Dry ice (more as needed)

Objective: Just as the increase in atmospheric CO₂ is causing the global air temperature to rise, the container with the added CO₂ will trap more heat inside and will show a higher internal temperature.

Overview: This activity/demonstration can be used directly following lessons on greenhouse gasses and their effects on warming the atmosphere by allowing shortwave UV energy to pass through to the ground, while trapping the Infrared energy before it can escape. The students will be introduced to a situation that they must try to discover and explain based on what they have learned about greenhouse gases. They can hypothesize that the atmosphere in container C has been changed in some way to increase the temperature. This can also be performed as a typical experiment where students can introduce the CO₂ in the container.

Preparation and Procedure:

Note: About two hours before you introduce the set up to your students you need to place the dry ice and one of the thermometers inside one of the sealed containers allowing the entire cube to sublime and the thermometer to return to room temperature. You will want to set up the three lids before the students see what you are up to.

- 1) While inside, place the three lids to the containers upside down on a flat surface. Label them as A, B, and C.
- 2) Lay the thermometers on the lids so that they can be read easily. You may tape the thermometers in place, if needed.
- 3) Leave lid A uncovered.
- 4) Cover lid B with a clear food container and seal, or snap container closed.
- 5) Lid C has already been covered and sealed and now looks exactly like container B laying upside down. (You know that C is full of CO₂, but the

students don't know yet.) You can now introduce the set-up to the students or you can wait until the containers have warmed in the sun.

- 6) Carefully move all three lids into a sunny outside area and allow them to set for 20 – 30 minutes. Now you are ready to show them to the students.
- 7) Explain to the students that you have a problem. You have found this experimental set-up and observed the temperatures from each thermometer. Uncovered lid A has recorded the room temperature. Covered lid B has recorded the room temperature, which seems a little elevated, probably due to the container keeping some of the heat in. Covered lid C, which looks identical to lid B, seems to have a temperature that is higher than lid B.
- 8) In small groups, have the students observe the thermometers and the containers and record the temperatures. You then ask the groups to discuss what they have observed and to organize a hypothesis that may explain the difference in the three temperatures. In addition, each group may ask a question that may give them further information to support their hypothesis. (A group may ask if something has been added to the C container.)