

5.2

GLOBAL WARMING

How is water affected by the greenhouse effect?

Activity Time: 45 minutes

Background

Greenhouses are used to grow plants in all kinds of weather. The energy from sunlight is able to enter the greenhouse, and the glass traps the heat, warming the room and providing an ideal environment for growing plants. The atmosphere of the Earth acts just like the glass in a greenhouse. It allows the solar radiation (light) to pass through and traps the infra red radiation (heat) from the sun. This activity will demonstrate the greenhouse effect on the oceans using an open and closed container with a light source.

Directions

1. Ask: How does the temperature in an open container compare to that of a closed container?
2. Place 3 cups of water and 10 ice cubes in each of the containers.
3. Wait for 5 minutes. Take and record the temperatures of each of the containers.
4. Place saran wrap over one of the containers. Be sure to completely cover the container.
5. Place both containers in direct sunlight or at an equal distance from the heat source.
6. Leave both containers in the sun for 30 minutes.
7. Fill in information on board or on paper. [see chart.]
8. After 30 minutes, record the temperature of each container with each thermometer. (Slightly lift the edge of the saran wrap to measure the temperature of the covered container.)

Discussion

- Was there a difference in the temperature of the two containers? If so, which one reads a higher temperature?
- Explain why the final temperatures of the two containers were different. (*trapped heat*)
- Which container most closely represents the earth's atmosphere? (*Saran wrap is like atmosphere.*)
- Did you notice any change in the saran wrap? (*Condensation on underside of saran wrap-water vapor came in contact with a cooler surface appears as water drops.*)
- Were the results uniform for the class? Why not? (*Variables: position of thermometers, position of containers to heat source, different reading of thermometers before beginning.*)

Assessment

Use **Exit Ticket 5.2** to answer the following question: *How is water affected by the greenhouse effect?*

Extension

- What other earth materials could be tested? (Soil, rocks, sand, carbon dioxide) Design an experiment to test this.
- Discuss other examples of a closed system similar to the greenhouse effect. (An automobile parked in the sun can get over 120 F or 49 C as the sun's light and heat gets into the vehicle and is trapped inside, like the saran wrap over the pie tin.)

Related Activities

- How is a ziplock baggie like the atmosphere **(5.1)**

Materials

Per team

- 2 identical pie tins
- 6 cups water (3 cups for each container)
- 20 ice cubes (10 for each container)
- Saran wrap
- 2 thermometers
- Heat source (the sun on a hot day works best or use a heat lamp)
- Stop watch or timer

Vocabulary

Greenhouse effect: a general warming effect felt on Earth's surface, produced by greenhouse gases.

Atmosphere: the mixture of gases surrounding the Earth.

Greenhouse Gases: any gas that absorbs infra-red radiation in the atmosphere. Earth's most abundant greenhouse gases are: water vapor (36-72%), carbon dioxide (9-26%), methane (4-9%), and ozone (3-7%).

ALIGNMENT TO NGSS:

Scientific and Engineering Practices

- Asking questions
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts

- Cause and effect
- Systems and models
- Energy and matter
- Stability and change

Disciplinary Core Ideas

- K-5: ESS2.A; ESS2.D; ESS3.C
- 6-8: ESS2.A; ESS2.D; ESS3.C; ESS3.D