

# 5.4

# GLOBAL WARMING

## Is a warm or cold ocean a better “sink” for CO<sub>2</sub>?

Activity Time: 45 minutes

### Background

Carbon can be stored in three places on our planet: the atmosphere, the oceans and the land biosphere. A carbon sink is a reservoir that stores more carbon than it releases. The oceans are the largest carbon sinks on Earth, storing up to 93% of the planet’s carbon. As the surface and ocean temperatures begin to rise, what will happen to the carbon sinks in the ocean? This experiment explores which oceans hold more CO<sub>2</sub>—warm or cold.

### Directions

1. Explain what a carbon sink is.
2. Ask students to predict what will happen when 7 Mentos are dropped into a cold pop bottle and also in a room temperature bottle.
3. Take the students outside for the launch! A wall behind the bottle works well.
4. Place the cardboard on the open cold soda bottle and then put the Mentos roll on top.
5. Cut a 2 X 2 inch square out of cardboard for each tube, to keep the Mentos from falling in the bottle.  
*The goal is to drop all of the 7 Mentos into the bottle at the same time. Roll a piece of construction paper that the Mentos will fit into but still slide out of. Secure the roll of the tube with tape. Position the tube directly over the mouth of the bottle so all the candies will drop into the bottle at the same time. (Or use a strip of scotch tape to stick the Mentos on in a row and drop it in the bottle.)*
6. Remove the cardboard and let the Mentos fall in the bottle and get out of the way.
7. Observe the reaction. Record height of the geyser and how long the reaction took place.
8. Repeat experiment with room temperature soda.

### Discussion

- Which bottle had a bigger reaction with the CO<sub>2</sub> and Mentos?
- How do you know it was a bigger reaction?
- What observations did you make?
- Is there a difference in the amounts of soda in the two bottles? Which has more and what does that tell you?
- Which releases more CO<sub>2</sub> – warm water or cold water? Why?  
*The molecules in the room temperature bottle are hotter and are moving faster than the molecules in the cold soda. Less gas can be dissolved in the warmer room temperature liquid. In colder liquids, the gas molecules move slowly, causing them to diffuse out of solution much more slowly so more gas tends to stay in cold solutions.*
- As ocean temperatures begin to rise, will oceans become better sinks for carbon dioxide?

### Assessment

Use **Exit Ticket 5.4** to answer the following question: Is a warm or cold ocean a better “sink” for CO<sub>2</sub>?

### Extension

Try testing different amounts of Mentos to change the results or use a warmer pop bottle that has been left out in the sun.

### Related Activities

- Try the Cold Water Motion experiment with students at <https://www.cresis.ku.edu/education/iibLessons/iib015.pdf>
- Then discuss how ocean temperatures and the ocean currents allow the oceans to be the largest carbon sink.

### Materials

- 2 pkgs Mentos
- Two 2-liter bottles of clear diet soda (one room temperature and one cold)
- Scotch tape
- 2 cardboard 2x2 squares
- Timer or stopwatch
- Meter stick
- Construction paper or geyser tube found online at: <http://www.stevespanglerscience.com/product/2072>

### Vocabulary

**Carbon Sink:** an environmental reservoir that absorbs and stores more carbon than it releases, thereby offsetting greenhouse gas emissions.

### 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; ESS3.C; PS1.B; PS2.B
- 6-8: ESS2.A; ESS3.C; ESS3.D; PS2.B