



# Carbon Dioxide Sources and Sinks

## Student Activity Sheet

**DIRECTIONS** ► Form a group of three and follow the instructions below to investigate the impact of carbon dioxide (CO<sub>2</sub>) in the atmosphere and its effect on climate.

### Brainstorm

Write down everything you know about carbon dioxide in the space below.

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### Investigate

Each person in your group will rotate through the following three roles during the investigation:

- Equipment manager-collect all materials for the investigation; manage equipment use and safety.
- Facilitator and data collector-read protocol to your group; record observations and data.
- Technician-conduct investigation.

### Materials

- Safety goggles
- ~12cm of masking tape (to make labels)
- Sharpie
- 6 test tubes
- Test tube stopper with tubing
- Test tube rack
- A small beaker of BTB solution
- A small beaker of vinegar
- A small sample of baking soda
- 1 2.5cm x 2.5cm square of foil
- 1 15cm x 15cm square of foil
- 3 cotton balls
- 1 straw



## Part 1: Detecting CO<sub>2</sub>

Follow the steps to conduct an investigation to detect CO<sub>2</sub>. Record your observations and answer the thinking question in the space below.

1. Decide who will fill each of the group roles.
2. With small pieces of masking tape, label the test tubes A thru E (one test tube will be unlabeled).
3. Put test tubes A, B, and the unlabeled test tube in a test tube rack.
4. Fill test tubes A and B approximately 1/3 full with the BTB solution and place in the rack. Test tube A will be used as a control.
5. Fill the unlabeled test tube approximately 1/4 full of vinegar.
6. Using the foil, make a small “boat” for the baking soda. Fill 1/2 full of baking soda. (hint: The ‘boat’ should be small enough to easily fit into the test tube and float on the vinegar).
7. Carefully slide the foil boat inside the unlabeled vinegar test tube (hint: tilt the test tube at an angle and carefully slide the boat in, being careful not to allow the baking soda and vinegar to make contact).
8. Plug the test tube with the stopper and tubing.
9. Place the free end of the tubing in test tube B, making sure the end of the tubing reaches the bottom of the test tube. Place a cotton ball into the neck of the test tube B.
10. Mix the vinegar and baking soda together by GENTLY swirling the unlabeled test tube from side-to-side. Do NOT shake the test tube or turn it upside down.

**Observations:** *What did you observe when the bubbles moved into the BTB solution in test tube B?*  
(descriptions and sketches)

**Thinking question 1:** How can you use BTB as an indicator for the presence of CO<sub>2</sub>?



## Part 2: Animals and Plants

Next, conduct an investigation about carbon dioxide from plants and animals. Record your observations and answer the thinking questions in the spaces below.

1. Switch roles in your group.
2. Fill test tube C approximately 1/3 full of BTB.
  - Place a straw in the test tube.
  - Place a cotton ball in the test tube opening.
3. Gently blow in the straw.

**Observations:** *What did you observe when you blew in test tube C?*  
(descriptions and sketches)

**Thinking question 2:** How do the results of this investigation compare to Part 1?

**Thinking question 3:** Are animals a source of CO<sub>2</sub>? Describe how you know.



**Set up the next step of the investigation. It takes at least 24 hours for results.**

1. Switch roles in your group.
2. Fill test tube D approximately 1/3 full of BTB.
  - Place a sprig of Elodea into the test tube (Hint: Use a pencil to push it all the way to the bottom of the tube).
  - Wrap the tube in foil so that no light can get in.
3. Place test tube D in the test tube rack and leave for at least 24 hours.

**Next day**

4. Unwrap the foil. Record your observations in your notebook, adding both descriptions and sketches.
5. Using the now-unwrapped test tube D with Elodea, leave in the light and observe what happens.

**Observations:** *What did you observe when you first unwrapped the foil from test tube D?*  
(descriptions and sketches)

**Observations:** *What did you observe when you put the unwrapped test tube in the light?*  
(descriptions and sketches)

**Thinking question 4:** Are plants a source of CO<sub>2</sub>? Explain your thinking based on your investigations.

► Name: \_\_\_\_\_



## Part 3: Fossil Fuel - Sources of CO<sub>2</sub>

You will watch a class demonstration provided by your teacher. Record observations, notes, and questions in the space provided.

What is in the balloon? \_\_\_\_\_

- At the end of the demonstration, use test tube E to collect a sample of BTB from your teacher. You will compare all of your test tube samples.

**Make a prediction:** What will happen when you release the balloon's contents into the BTB?

**Observations:** *What did you observe when your teacher released the balloon's contents into the beaker?*  
(descriptions and sketches)

**What questions do you have after the demonstration?**

**Thinking question 6:**

Compare the colors in all of the test tubes, A-E. Are they different? If so, why? Explain your reasoning.

► Name: \_\_\_\_\_



## Part 4: CO<sub>2</sub> in the Atmosphere

Draw a picture below that shows how CO<sub>2</sub> enters and gets taken out of the atmosphere. Use the ideas from your investigations and the demonstration.

A large, empty rectangular box with a thin black border, intended for the student to draw a picture illustrating the carbon cycle.