

Background: Carbon atoms cycle through Earth's atmosphere, biosphere, geosphere, and hydrosphere. Each stop carbon makes is considered a source or sink of carbon. The amount of carbon in each sink varies as well as the amount of time carbon will spend in each sink.

Bromothymol blue is a chemical that indicates the presence of carbon dioxide. If carbon dioxide is present, bromothymol blue solution will turn greenish yellow. The lighter the bromothymol blue becomes, the more carbon is present in the solution.

Materials: Test tube rack, 5 test tubes, one hole stopper with tubing attached, baking soda, vinegar, aluminum foil, cotton balls, bromothymol blue, straws, Elodea plant, overhead markers

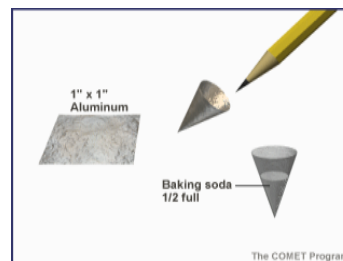
Procedures:

1. Work in groups and follow the instructions carefully for each experiment.
2. Record data for each experiment.
3. Answer the analysis questions.

Experiment 1: Detecting CO₂ Gas

Materials: masking tape, test tube rack, 3 test tubes, labeling marker, 1 square inch of foil, vinegar, bromothymol blue, baking soda, cotton ball, rubber stopper with tubing

1. Using an overhead marker, label 4 test tubes A thru D. Leave the 5th test tube unmarked. Place all test tubes in the tube rack.
2. Fill test tubes A & B 1/3 full with bromothymol blue. (Test A is the control test tube.)
3. Fill the unmarked test tube 1/4 full of vinegar.
4. Using the foil, make a small "boat" for the baking soda (see Diagram A). Be careful not to poke a hole in the foil.
5. Fill the foil boat 1/2 full of baking soda.
6. Carefully slide the foil boat inside the unlabeled vinegar test tube. Tilt the test tube a little to make it easier. Be very careful, you don't want any baking soda to get into the vinegar yet. (See Diagram B)
7. Place the stopper in the vinegar test tube once the foil boat floating in the vinegar.
8. Place the other end of the rubber tubing into test tube B. Make sure the tubing touches the bottom of the test tube. Stuff the cotton ball in the neck of test tube B so that air won't go in or out. (See Diagram C)
9. Mix the vinegar and soda together by GENTLY swirling the from side-to-side. Don't shake it upside down!



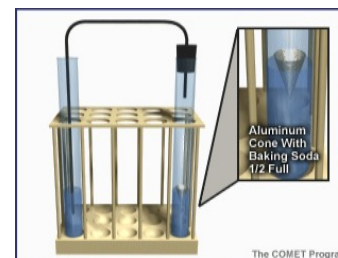
test
tube

Diagram A



is

Diagram B



tube

Diagram C

Data: Record observations below.

Experiment 2: Are animals a source of CO₂?

Materials: 1 test tube, bromothymol blue, straw

Procedures:

1. Fill test tube C 1/3 full of bromothymol blue.
2. Place a straw in the test tube and gently blow. (Be careful not to suck any bromothymol blue up!)

Data: Record observations below.

Experiment 3: Are plants a source of CO₂?

Materials: 1 test tube, bromothymol blue, piece of Elodea plant, aluminum foil

Procedures:

1. Fill test tube D 1/3 full of bromothymol blue
2. Place a piece of Elodea plant in the test tube. (Use a pencil or pen to push it all the way into the bottom of the tube)
3. Wrap the tube in foil so that no light can get in.
4. Place in test tube rack and leave for 24 hours.

Data: Record observations below.

Experiment 4: Do Plants take up CO₂?

Materials: test tube with Elodea from Experiment 3, heat lamp

Procedures:

1. Unwrap test tube D.
2. Place the test tube near a heat lamp and leave it for about 20 minutes.

Data: Record observations below.

Experiment 5 (Teacher Demonstration): Are Fossil Fuels a Source of CO₂?

Procedures:

1. Watch the demonstration given by your teacher.
2. Record observations in the data section.

Data: Record observations below.

Analysis:

1. Compare the colors in the tubes A-D and test tube E from your teacher's demonstration. What does the color of the solution tell you?
2. If you wished to reduce the amount of increase of carbon in the atmosphere, which source would be most important to control? Explain why.
3. Would there be problems with controlling the things you mentioned in question 1? Why or why not?
4. Do plants produce carbon dioxide? Explain why or why not.
5. Describe the role of fossil fuels in the carbon cycle.
6. What are the sources of carbon?
7. Write a brief description of an experiment that tests for carbon in another source.

Conclusion: Write 2-3 things you learned in complete sentences.