



## LAB ACTIVITY: GETTING TO KNOW CO<sub>2</sub>

**OBJECTIVE:** Students will become familiar with the basic properties of carbon dioxide through a series of simple demonstrations.

### DEMO 1: PROPERTIES OF CO<sub>2</sub>

#### MATERIALS:

- + Beaker
- + Measuring spoon
- + Glass test tube
- + Baking soda
- + Wooden splints
- + Matches
- + Vinegar
- + Cork stopper



#### PROCEDURE:

1. Use the background information provided to discuss the science behind greenhouse gases, global warming and how correct levels of both carbon dioxide and oxygen are vital to a healthy planet.
2. Explain that in this activity you will demonstrate how to produce pure carbon dioxide using baking soda and vinegar.
3. Place 1 teaspoon of baking soda into a re-sealable bag and ensure the soda falls to the bottom.
4. Using the beaker, measure and pour 200mm of vinegar into the test tube and seal as quickly as possible with the cork stopper.



## Teacher Sheet 2

5. Explain to the students that the vinegar is reacting with the chemicals in the baking soda which makes it produce carbon dioxide. Allow the students to move in closer to watch as the mixture in the test tube begins to bubble. Being an **endothermic reaction**, it should be quite cool to the touch.



6. Next, light the end of a wooden splint and allow it to burn for a few seconds. Explain to the students that if there is pure carbon dioxide in the bag, the splint will immediately extinguish because there is no oxygen, which is necessary for fire.



7. Remove the cork from the test tube and slowly insert the splint; it should extinguish immediately.

8. Students should record all observations and answer the questions in the **ANALYSIS** section that pertain to **DEMO 1**.



## DEMO 2: ANIMALS AND CARBON DIOXIDE

### MATERIALS:

- + lime water (lime powder and water)
- + glass test tube
- + filter paper
- + funnel
- + straw



## PROCEDURE:

1. Prepare the limewater to use as the indicator for  $CO_2$ .

- + Mix 1 teaspoon of lime powder with 1 cup of water.
- + Fix the filter in the funnel and set in the jar the mixture.
- + The lime water in the jar should be clear.

2. Fill the jar half full with limewater.

- + Cap the jar and shake it vigorously so that the air bubbles through the limewater. The liquid should still be quite clear; the room air is only about 0.03%  $CO_2$ .

3. Blow through the straw into the limewater.

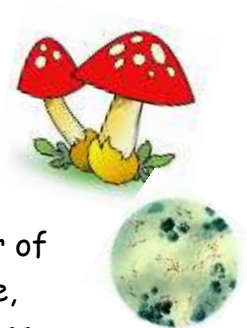
- + The water should cloud up quickly indicating that  $CO_2$  has been added. The air animals breathe out is about 0.04%  $CO_2$  which is formed by the breakdown of sugars in our cells.

5. Students should be recording what they see happen in their lab notebooks and then complete the questions in the **ANALYSIS** section that pertain to this demonstration.

## DEMO 3: DECOMPOSERS AND $CO_2$

A vital part of all food chains in any ecosystem are the decomposers. Because they have no chlorophyll, fungi and bacteria get their energy by breaking down the dead plant and animal tissue. In the process, large amounts of  $CO_2$  are produced. Decomposition is occurring all the time on the floor of a forest, at the bottom of the ocean, in the soil of the prairie, and in the mud of a marsh. It is a normal and necessary process.

When human upset the balance in these communities by cutting down trees or plowing the land, for example, decomposition occurs at faster rate, adding even more  $CO_2$  to the atmosphere.



## Teacher Sheet 4

**OBJECTIVE:** To produce, collect and detect  $\text{CO}_2$  from decomposition;

### MATERIALS:

- + 1 package of dry yeast
- + sugar
- + water
- + measuring cup
- + Empty plastic pop bottle (clear)
- + 1 large balloon

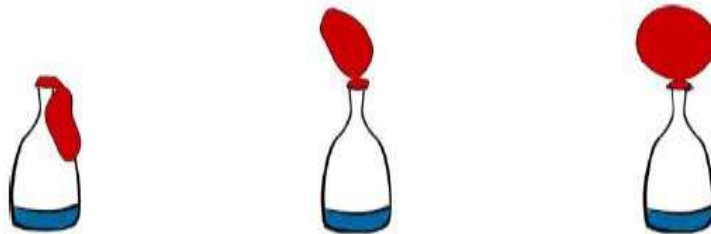


### PROCEDURE:

1. Dissolve 2 cups of sugar in  $\frac{1}{2}$  pop bottle of warm water. (Not boiling!)
2. Add a teaspoonful of yeast to the liquid and shake vigorously.

**NOTE:** Yeast is a fungus that feeds on sugar. Even though the package appears to contain nothing but a dry powder, the powder is really living, one-celled plants that are alive but in a dormant stage. They become active breakdown the sugar in alcohol and release  $\text{CO}_2$ .

3. Fit the balloon over the mouth of the bottle.



4. Students should observe and record what happens.
5. Students should answer the questions that pertain to this demo in the **ANALYSIS** section.

## DEMO 4: PLANTS and CARBON DIOXIDE

Since the Earth's atmosphere formed, it seems to have always contained carbon dioxide in varying amounts. Carbon exchange with the atmosphere mostly happens through photosynthesis and respiration. During the growing season leaves take up carbon dioxide. Carbon is stored in the living biomass. Humans, as all life on Earth, have always been part of the carbon cycle, but now the large scale burning of oil, coal and natural gas, along with deforestation, is leading to increasing atmospheric carbon dioxide levels. This in turn is related to an enhanced greenhouse effect and consequent climatic change. An understanding of the factors affecting global warming leads to an understanding of the measures required to reduce their impact. This can link into economic and political debates on the subject.

### MATERIALS:

✚ 3 test tubes

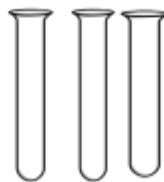
✚ A drinking straw

✚ Boiled water

✚ Phenol red indicator (which is red and goes yellow in the presence of carbon dioxide)

✚ A sprig of *Elodea*

✚ Bright light



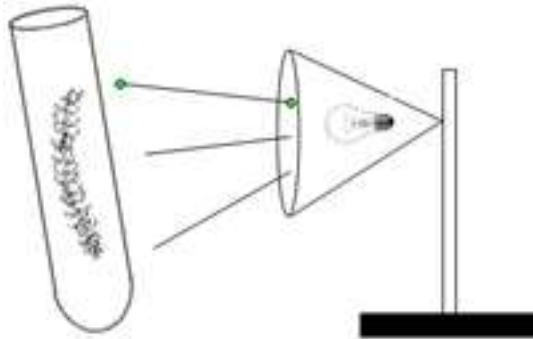
### PROCEDURE:

1. Pour about 2-3 cm depth of water into each test tube (same depth in each).
2. Add a few drops of indicator to each.
3. Breathe out gently through the straw into two of the tubes until the indicator color changes to yellow.
4. Put the sprig of *Elodea* into one tube.



Teacher Sheet 6

5. Place all three in bright light and leave them for about 40 minutes.



6. Go back and observe what has happened to the three tubes.
7. Students should record their observations and answer the **ANALYSIS** questions which pertain to this demo.