

“What’s going on with plants and CO₂?”

INTRODUCTION

We learned that all living things use O₂ and give off CO₂ in the process of cellular respiration. Yet we have also been told that plants use CO₂ and produce O₂. In this investigation we will try to figure out exactly what is going on with CO₂ and plants. Do they give it off? Do they use it? Could they possibly do both? Does it matter whether they are in the dark or in the light?

You will be provided with materials you may need to try to answer these questions. You will decide how you wish to set up your test tubes to give you the information you need. You may work only with the materials given, but you may set up the experiment however you choose. Remember that you need to include **control** (comparison) test tubes for each experimental tube you set up in order to get meaningful results.

As our indicator of CO₂ in this lab we will use bromothymol blue (BTB). The instructor will demonstrate the properties of BTB for you before you begin the lab. Think about how the BTB will help you to uncover what is happening as you work to design your experiment.

MATERIALS PROVIDED

Elodea (*an aquatic plant*)
 Bromothymol Blue aka BTB (*an acid-base indicator*)
 Test tubes with caps (or corks)
 Straws
 Foil to cover tubes (*for “DARK”*)
 Lamp
 Test tube rack
 Labels
 Beakers



PROCEDURE

1. Plan how you will test each experimental question. You will put BTB in each tube, but what else will you put in? Will you add CO₂? A plant? Where will you put each tube – in the light, or in the dark? *You may use as few or as many as you want up to a maximum of 10 tubes.* Show your plan by coloring the test tubes above blue or yellow depending on whether you will add CO₂ or not. Draw a green plant in the tubes that will have a plant. Above each tube write “L” or “D” to show whether it will go in the light or dark.
2. Once your group decides on a plan, set up a data table like the one shown on the next page, adding rows as needed for each test tube. Number your tubes. (You will put this number on the label when you set up this tube). Complete the first 4 columns showing what you will put in each tube, whether it will be in the light or dark, what color it is at the start and what color you predict it will be at the end.
3. Set up your test tubes according to your plan. Label each one with its number, your period and table #.
 - a. If you decide to add CO₂, do so by bubbling your breath through the BTB. Stop as soon as it changes color!
 - b. If you decide you need any test tubes without plants, tell the teacher what you want to put in the test tube and whether you want it in the light or the dark. The teacher will set-up that test tube for you.

4. When test tubes are ready, record initial indicator colors for each tube and complete the “Expected Indicator Change” column for each one. These are your hypotheses.

5. The next day record the final indicator colors and complete the “Interpretation” column. Tell what the change (or perhaps, lack of change) tells you about what the plant is doing.

SAMPLE DATA TABLE

(You may design your own, but the instructions refer to this sample.)

SAMPLE DATA TABLE

TEST TUBE #	MATERIAL ADDED	TREATMENT	Initial Indics Color
1	List everything you put in the	Tell where you put the test tube / LIGHT	

(Please complete on a separate sheet of paper.)

1. Compare your group’s results with at least 2 other groups. Did your results agree with the other groups? If not, what was different and how can you account for the differences?
2. Check your data. Do any of your expected changes (hypotheses) disagree with your actual changes? Explain any differences.
3. Did you have the proper controls (comparison tubes) needed to make sense of your data? If you not, what controls should you have set up?
4. Which test tubes changed color?
 - a. What do those changes tell us about the substances present in each?
 - b. For each tube that changed, tell what life process you believe is responsible for the change in color.
5. Do you have any evidence from your experiment that light alone does not change the color of BTB?
6. Is CO₂ involved in a plant that is not carrying on photosynthesis? If so, how? What evidence from your experiments supports this statement?
7. Did the design of your experiment allow you to answer all parts of the experimental question? If not, what could you do differently next time?

