

Title: Probing Photosynthesis

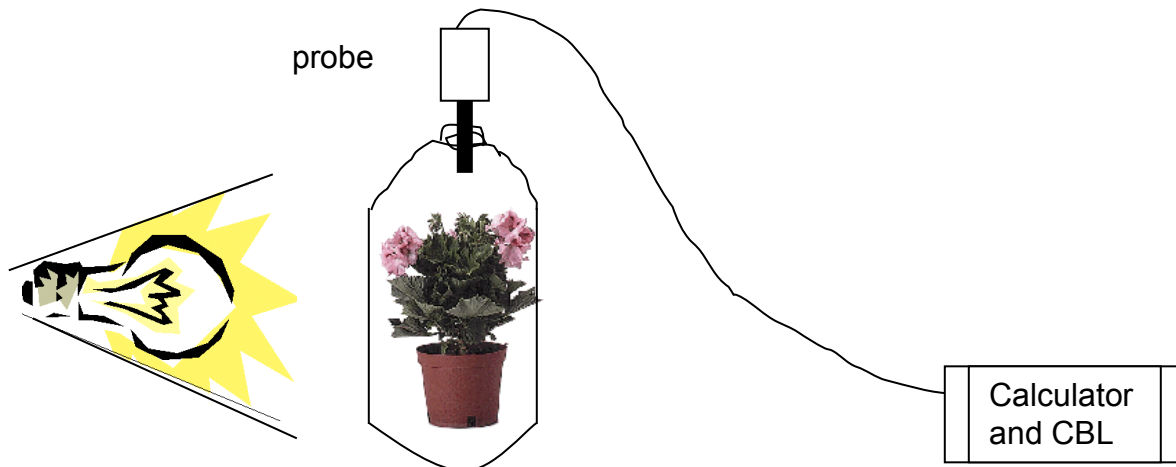
Introduction: Understanding photosynthesis is complicated by the fact that the gasses involved in it are invisible and photosynthesis happens slowly. Both factors make it difficult to measure the rate that CO_2 is taken up by plants. In this activity you will use some wonderful tools, a CBL unit, a graphing calculator and a CO_2 probe that together are able to measure very small changes in CO_2 . First, see if you can write the formula for photosynthesis below:

Why is measuring CO_2 a way to measure the rate of photosynthesis?

Materials: per group-a CBL, a TI-73 calculator, CO_2 probe, plant, light source, cover for plant

Directions:

1. The lab set-up will look like this:



2. The light will be turned on and CO_2 levels (in parts/million) will be recorded for 3 minutes.
3. Start by turning your calculator on, loading Datamate from the applications and check to see if the probe is working. Try breathing on the probe and watching the readout. It should jump to a much higher number.
4. Now it is your turn to design an experiment. The control should be set-up similarly to the diagram. When ready, turn on the light and collect 3 minutes of data.
5. Record your data on the data table by pushing "quit", then "enter", then the "list" button. The list will show your time and CO_2 concentrations.
6. For your experiment, change one variable and do the experiment again, using the same equipment. Make sure the bottle has been "aired out" so you are starting over with about the same amount of CO_2 .
5. Record the data in your data table and graph the results.

6. Calculate slopes for each line. Pick two points that seem to best represent the curve of the line and calculate the slope. The slope of the line is a measure of the rate of photosynthesis. The higher the number, the greater the rate. The number will be negative because the line is going down.

$$\text{Slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

7. Analyze your data and think of reasons why it turned out as it did. Be prepared to report on your data and conclusions.

Data:

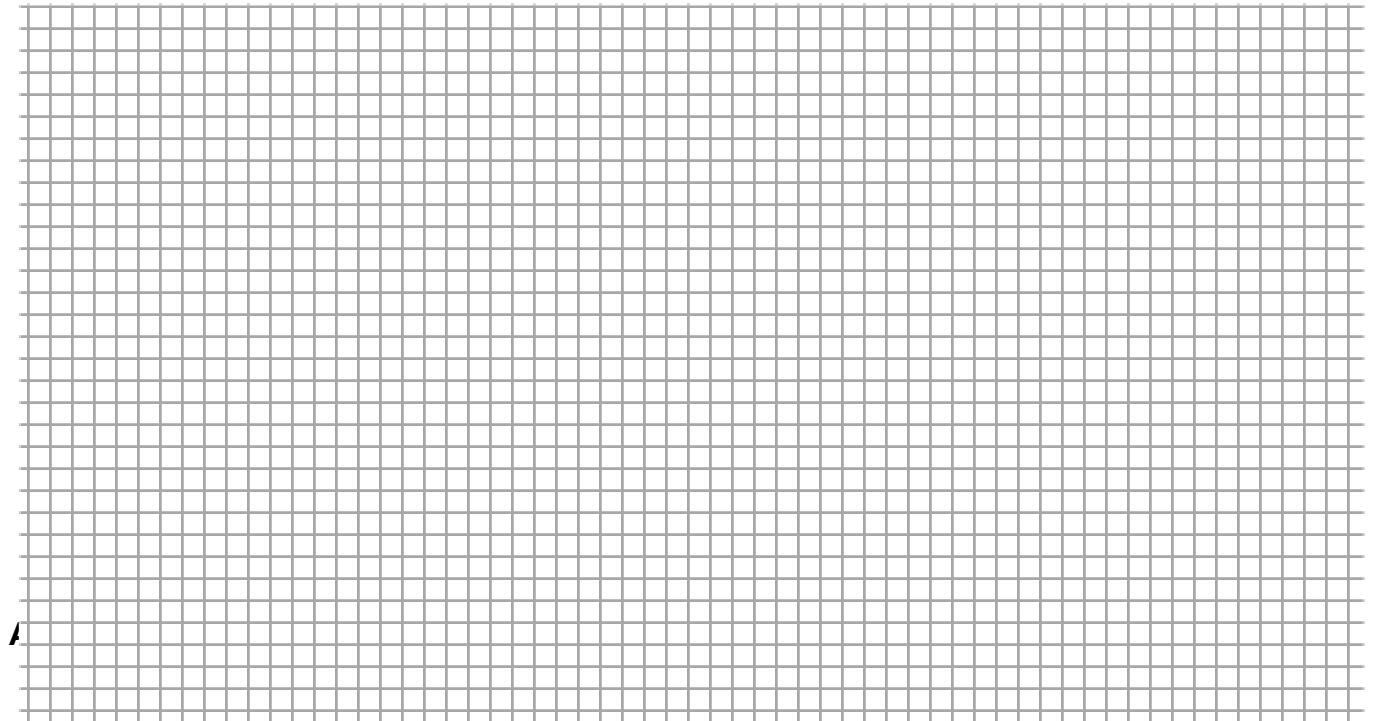
Time	CO ₂ Concentration Control	CO ₂ Concentration Experiment
0		
10		
20		
30		
40		
50		
60		
70		
80		

90		
100		
110		
120		
140		
160		
180		

Slope for control=

Slope for experiment=

Graph:



1. How did the rate of photosynthesis for your experiment results differ from the control?
2. Why do you think they were different??
3. Which experiment in class produced the greatest rate of photosynthesis?
4. Why do you think it did?
5. Which experiment in class produced the lowest rate of photosynthesis?
6. Why do you think it did?
7. Scientists are concerned that humans are adding dangerous levels of CO₂ to the atmosphere. What affect might raised CO₂ have on plants?
8. How could you find out using this equipment?

Conclusion: