# Plant Respiration and Photosynthesis

Driving Question

Do plants perform cellular respiration, in addition to performing photosynthesis?

Materials and Equipment

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| --- | --- |
| * CO2 sensor | * Box or heavy cloth (to cover the bottle) |
| * Sensor extension cable | * Aluminum foil, 1 ft. |
| * Sampling bottle (included with sensor) | * Lamp, 100-W (or equivalent) |
| * Water | * Mint, or similar, plant |
| * Large beaker or aquarium (to keep the light source from heating the sample) |  |

Background

* Since CO2 is produced during cellular respiration, an increasing CO2 concentration inside a mini-terrarium when no light is present is evidence that cellular respiration is occurring. Cellular respiration occurs 24 hours a day in plants. However, under lighted conditions, photosynthesis is also occurring, which may consume CO2 faster than the cellular respiration processes produce it. In this instance, the net effect during lit conditions is for the concentration of CO2 in the air inside the mini-terrarium to decrease.

Procedure

1. Connect to the CO2 sensor.

2. Open the Plant Respiration and Photosynthesis lab file.

3. Display the CO2 Concentration in parts per million (ppm) on the y-axis versus Time in seconds (s) on the x-axis of a graph.

4. Gently push several leaves of the plant into the sampling bottle. Arrange the stems so that the majority of the leaves face in the same direction. Add 25 mL of water to the sampling bottle.

5. Calibrate the CO2 sensor. Place the CO2 gas sensor into the sampling bottle so that the rubber stopper firmly plugs the end of the bottle.

6. What do you think will happen to the CO2 level in the bottle while the plant is in the light? Explain your answer.

7. Place the large beaker or aquarium that is full of water between the light source and the bottle to keep the light source from overheating the sample. Turn on lamp. After the light is turned on, wait 3 to 4 minutes, and then start data recording for 10 minutes, and then stop data recording. Name the data run “Light”.

8. Record data in Table 1 in the “Initial CO2 Level” column and light row.

9. Turn off the lamp. Carefully cover the sensor and sampling bottle with a box or a heavy cloth to block out any ambient light.

10. What do you think will happen to the CO2 level in the bottle while the plant is in the dark? Explain your answer.

11. Start data recording for 10 minutes, and then stop data recording. Name the data run “Dark”.

12. Record data in Table 1 in the “Final CO2 Level” column and darkness row.

Table 1: The change in the CO2 level inside the mini-terrarium in darkness and in light

|  |  |  |  |
| --- | --- | --- | --- |
| Light Condition | Initial CO2 Level | Final CO2 Level | Change in CO2 |
| Light |  |  |  |
| Darkness |  |  |  |

Analysis & Questions

1. What happens to the level of carbon dioxide gas when the plant is in darkness? Why does this happen?
2. What happens to the level of carbon dioxide gas when the plant is in bright light? Why does this happen?
3. Was there a greater change in the level of carbon dioxide in darkness or light?
4. Which part of the activity shows the effect of cellular respiration on CO2 levels in the chamber?
5. Write a conclusion for this experiment based on the following hypothesis, "If plant in a closed environment is exposed to light then the CO2 level will rise when compared to its initial CO2 level.”
6. Answer the driving question, “Do plants perform cellular respiration, in addition to performing photosynthesis?