Leaf Disk Investigation

**Question**: What is the effect of carbon dioxide on photosynthesis?

1. Write 1-2 sentences to describe what you know about photosynthesis.  
   Photosynthesis occurs mainly in plants and it makes oxygen from carbon dioxide. If there is no carbon dioxide, there will be no photosynthesis.
2. How did you investigate this research question? (Describe the procedure in 5 or 6 sentences)  
    We punched holes in spinach leaves to make leaf disks. Then we had somebody fill three beakers with distilled water, then somebody blew into a beaker of distilled water for 60 seconds, and somebody put a pinch baking in one beaker. Then we poured the leaf disks into syringes along with one of the solutions (distilled water, baking soda, and breath). We created a vacuum to get rid of all the air in the leaf disks and syringe. We then went outside and poured the leaf disks into the beakers and put them in sunshine. Then we recorded how many disks were floating and not floating each minute.
3. Write your predictions for the leaf disks in each cup.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Predictions | | |
| Breath Beaker | Baking Soda Beaker | Water Beaker |
| What will happen to the disks? | If a leaf disk is placed in a solution with breath, then all of the leaf disks will float. | If a leaf disk is placed in a solution with baking soda, then some leaf disks will float. | If a leaf disk is placed into distilled water then the leaf disks will not float. |
| Why do you think this will happen? | There is carbon dioxide in the solution. | There is some carbon dioxide in the solution. | There is no carbon dioxide in the water |

As you conduct the investigation, record your data in the following chart. Time 0 is just after you put the disks in the beaker and they have settled at the bottom.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time  (minutes) | Breath | | Baking Soda | | Water | |
| Number  Floating | Number NOT Floating | Number  Floating | Number NOT Floating | Number  Floating | Number NOT Floating |
| 0 | 0 | 12 | 0 | 12 | 0 | 12 |
| 1 | 0 | 12 | 0 | 12 | 0 | 12 |
| 2 | 0 | 12 | 0 | 12 | 0 | 12 |
| 3 | 0 | 12 | 0 | 12 | 0 | 12 |
| 4 | 0 | 12 | 0 | 12 | 0 | 12 |
| 5 | 0 | 12 | 0 | 12 | 0 | 12 |
| 6 | 0 | 12 | 1 | 11 | 0 | 12 |
| 7 | 0 | 12 | 3 | 9 | 0 | 12 |
| 8 | 2 | 10 | 9 | 3 | 0 | 12 |
| 9 | 3 | 9 | 12 | 0 | 0 | 12 |
| 10 | 4 | 8 | 12 | 0 | 0 | 12 |
| 11 | 7 | 5 | 12 | 0 | 0 | 12 |
| 12 | 9 | 3 | 12 | 0 | 0 | 12 |
| 13 | 11 | 1 | 12 | 0 | 0 | 12 |
| 14 | 12 | 0 | 12 | 0 | 0 | 12 |
| 15 | 12 | 0 | 12 | 0 | 0 | 12 |
| 16 | 12 | 0 | 12 | 0 | 0 | 12 |
| 17 | 12 | 0 | 12 | 0 | 0 | 12 |
| 18 | 12 | 0 | 12 | 0 | 0 | 12 |
| 19 | 12 | 0 | 12 | 0 | 0 | 12 |
| 20 | 12 | 0 | 12 | 0 | 0 | 12 |

1. Use the following chart to describe what you learned from your data.

|  |  |
| --- | --- |
| **What evidence from your leaf-disk experiment helps you answer your research question?** (you may add more rows by pressing the tab key if you have run out of space.) | **Related Science Ideas** (You may have information from the reference readings or even prior experiences that relate to evidence from your experiment.) |
| Example: Bubbles formed around the edges of the leaf disks in the water with the baking soda | Example: The bubbles caused the leaf disks to float because gas is less dense than water. |
| Leaf disks only floated in the solutions with carbon dioxide | The oxygen produced by photosynthesis made the disks float |
| If there is more carbon dioxide present, photosynthesis will occur faster | The leaves are thin so that way they have more surface area for sunlight |
|  |  |

1. Write a sentence to answer your research question (this is your claim)  
   The more carbon dioxide present, the faster photosynthesis occurs.
2. How did your results compare to your predictions?  
   The results proved our predictions to be correct.
3. What did you learn from the demonstration that helped you understand the leaf disk activity?  
   The demonstration helped me understand how leaves aid in photosynthesis and how air goes through the leaves.

1. Were the results of your experiment similar to those of other teams? If so, what could be some factors that account for the differences?  
   The results are similar because we all did the experiment the same way and we all used the same data. Some factors that could have caused different results are: somebody doing steps prematurely, crushing some leaf disks and not realizing it, failure to remove all of the oxygen from the disk.
2. Refer back to the ideas about photosynthesis you wrote in question #1. Do your experimental data provide information that either support or contradict some of your initial ideas about photosynthesis? Please explain.   
   The experimental data provides information that supports my ideas about photosynthesis. The data showed that carbon dioxide was needed for photosynthesis and once photosynthesis started and oxygen was produced, the leaf disks started to float.