Photosynthesis Investigation

Aim: The problem we are trying to solve is the how a variable can affect the rate of photosynthesis, whether it is light intensity, CO_2 concentration or the temperature of the water that the pond weed is submerged in.

Planning:

- Variables:

  We have 3 main variables: light intensity, CO_2 concentration and temperature of water.
  The light intensity will affect the experiment significantly due to the fact that light energy is needed for photosynthesis to occur. Without light energy there will be no photosynthesis.
  CO_2 concentration will also affect the experiment because a plant takes in carbon dioxide and is the key ingredient for photosynthesis to happen.
  Temperature of the water will have a slight affect on our results because of the presence of enzymes in plants. Having the temperature too high will kill the enzymes causing them to denature, having the temperature too low and the enzymes will not work at their optimum efficiency.

- Experimental Variable:

  The variable that I will choose to change will be the 'CO_2' level. This is to ensure we will record a graph that will level off at a certain point. If we were to choose 'light intensity' as our variable we would only record a straight line graph. I am going to keep the light intensity and temperature of water constant and only change CO_2 level. The Light intensity will remain at its closest to the pond weed (100%) and the temperature at its optimum of 20°C.

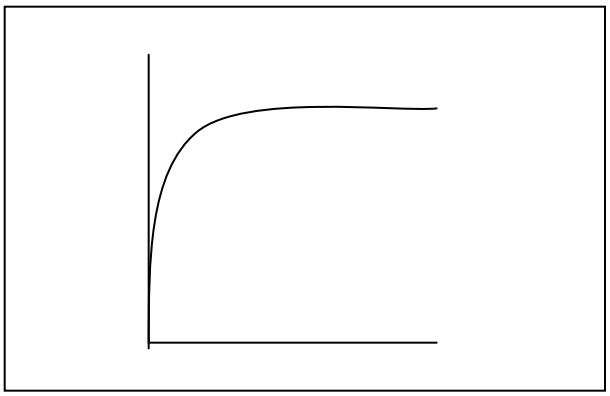
- Fair Test:

  To ensure this experiment is a fair test I have to make sure I don't change any variable unless it is the CO_2 level. This is so my results will be accurate and constant. I must remember that CO_2 is my variable and I must not change anything else.

- Prediction:

  I predict that there is an optimum level of CO_2 and at some point during the experiment the results will level off. This may be because the leave is taking in all the CO_2 it can and is working at its maximum rate. I have chosen the temperature and light intensity values with the help of my pre-test and I found that the higher the light intensity the more light the pond weed has to absorb. The temperature is at 20°C because the plant contains enzymes that work at their optimum rate at temperatures up to 25°C.

I predict that my graph will look something like this:



- Hypothesis:

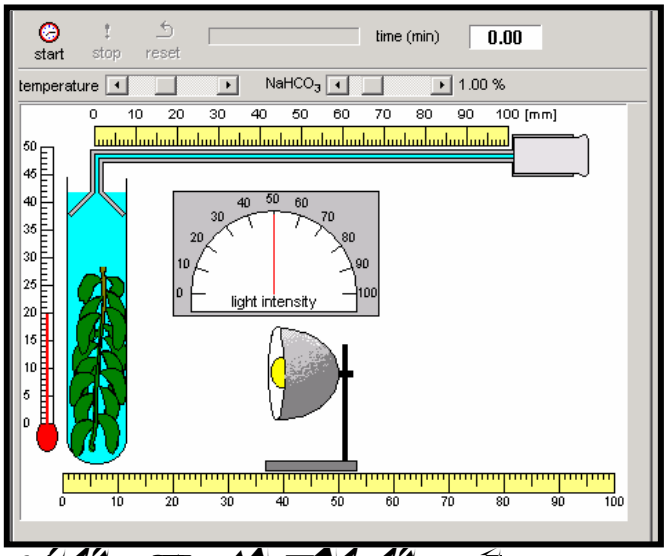
I have chosen the temperature and light intensity values with the help of my pre-test and I found that the higher the light intensity the more light the pond weed has to absorb. The temperature is at 20°C because the plant contains enzymes that work at their optimum rate at temperatures up to 25°C. If the temperature is too high the pond weed will die and become 'denatured'. CO_2 is need for photosynthesis to occur, which is why changing the CO_2 is a good variable.

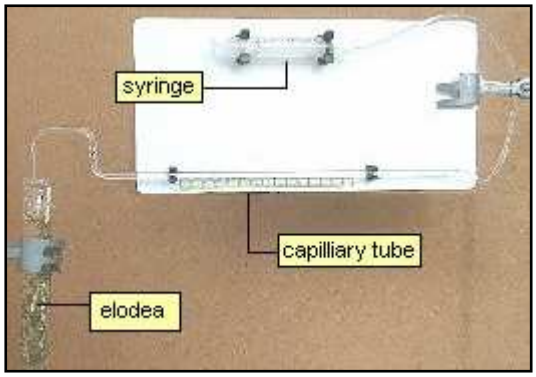
- Method:

The apparatus we are going to use to carry out this experiment are:

- boiling tube
- pond weed
- clamp
- capillary tube
- syringe
- Bunsen burner
- Light source
- Thermometer
- NOTE. (All this experiment is carried out on a computer program so the experiment will be already set up.)

Diagrams:





Instructions:

The program organises the lay out of the experiment for us so there is no need for any preparation. The only instructions needed are that you must change the variable you want before 'starting' the experiment each time.

Measurements:

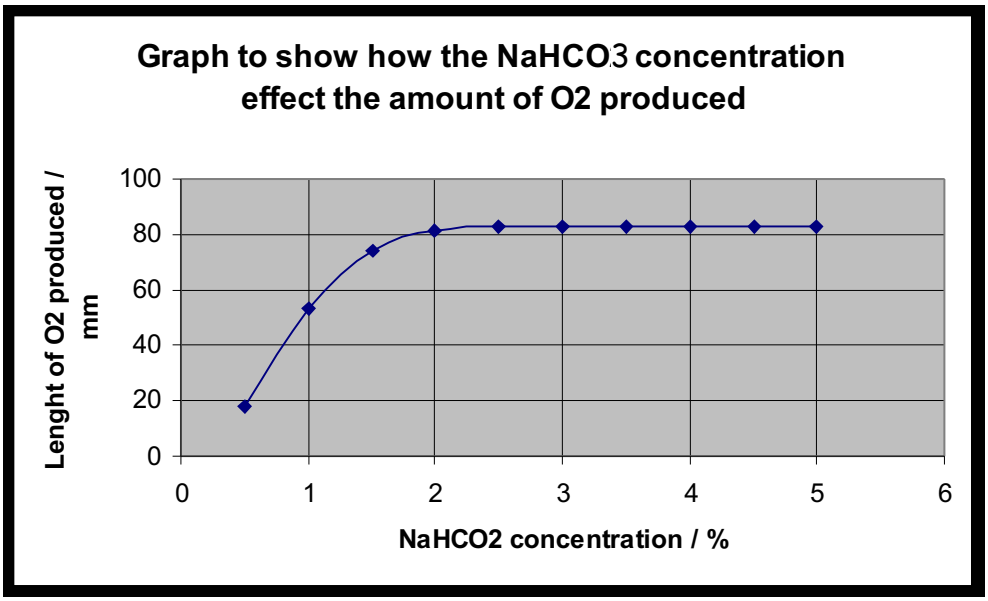
I will measure the CO_2 level and this will also be my variable. The light intensity and temperature of water will be my constant and I will only change the CO_2 level. The Light intensity will remain at its closest to the pond weed (100%) and the temperature at its optimum of 20°C.
My range of measurements for the CO_2 level will range from 0.50% to 5.00%. If this test was to be real and without the aid of a computer I would probably repeat the test 3 times, and then take an average to ensure consist, accurate results. But since we are using a computer program there is it not possible and there is no need for any results to be repeated. This is because the program gives us perfect, non-repeatable results.

Table of Results:

$NaHCO_3$ concentration / %	Length of O_2 produced / mm
0.50	18
1.00	53
1.5	74
2.00	81
2.5	83
3.00	83
3.5	83
4.00	83
4.5	83
5.00	83

Analysing & Concluding:

Graph:



Conclusion:

My results show me that variable I chose did have an effect on the amount of O_2 produced. I can see this in my results table and graph by the way the numbers increased steadily and then levelled off. The same was found with my graph. This tells us that there is a limit and a boundary that a plant can work at. Even if we raised the amount of light and CO_3 the results still would level off, but quicker and it's possible that the results would level off and read the same reading each time.
My prediction was correct and my predicted graph shape was also correct, this concludes my prediction agree with my prediction.

Evaluation:

The experiment gave me fairly accurate results overall but again since we were using a computer program we couldn't repeat our results to give us an average. Our results were fairly accurate and reliable, but weren't repeatable.
My results were very good because there were no anomalous results which gave us a nice graph. There was no way I could improve the method because it's a computer that we used and there was a fixed way how we could do the experiment, and the only flexibility had were the 3 variables.

We could of done at least two more different experiments with the variables that we were given; changing the temperature or changing the light intensity. Both these different experiments would of given us comparatively different results and graphs.