Biology Coursework- Photosynthesis

Introduction:

Photosynthesis is the process that is used by plants to produce energy from carbon dioxide (CO_2) + water (H_2O) and light energy.

The word equation for this is:

Carbon dioxide + water ---------- (Light energy) → Glucose + Oxygen

This can also be put into this symbol equation:

$6CO_2 + 6H_2O \xrightarrow{\text{light energy}} C_6H_{12}O_6 + 6O_2$

The Factors which affect the rate of photosynthesis are Carbon dioxide levels, Light Intensity, Temperature (how hot or cold if it varies),Wave length (colour or light),Amount of water and Chlorophyll

The reason I chose to look at light intensity are because it is simple to measure and can be repeated without difficulty a range of times. A plant can live with lots of water and carbon dioxide, but it will not photosynthesise very quickly if there is not enough light; so increasing the light intensity will make photosynthesis faster, therefore decreasing it will slow photosynthesis down.

I have carried out a previous experiment on photosynthesis by starch testing leaves to find out what necessary conditions for photosynthesis were.

The results of that test showed that plants photosynthesise more when in a warm, moist environment with plenty of nutrients in the ground.

When I increase the light intensity I think that the rate will increase and then level out because the more powerful the light the faster the photosynthesis takes place. But at high levels of light intensity the rate will stay the same.

The sketch graph of the results I expect would look like:

I'm going to measure it by using a light metre that will get amount of lumens. I could change the light intensity by moving the light bulb further and further away or put transparent sheets in the middle of the light and plant to make the light less powerful.

To measure the rate of photosynthesis I could measure the length of bubbles produced, or count the number of bubbles released. Counting them has the problem that the size of the bubbles will not be the same, and so it isn't accurate enough to use on its own.

One problem with my methods are that when the pondweed photosynthesises some of the oxygen released will go into the water and won't released as bubbles; so I cant really measure all of the oxygen. Another problem is that plants also use some of the oxygen they produce, which again is not possible to measure. But this factor might not affect the results, as it is still fairly regular and the volume of oxygen not sent out as bubbles are very little and insignificant as a result the results will be quite fair, and reliable for all the experiments.

Another problem that I will have is that the CO_2 concentration in the water will go down as the plant photosynthesises. However this doesn't matter much as it is outweighed by the need to have a steady and reliable size surface area

To make the experiment a fair test I would have to keep the following things constant:

- The water concentration
- The leaf area
- The carbon dioxide (CO_2) concentration
- The wave length
- The temperature

To make my results as exact as possible I would have to repeat the experiment about three times to see if the patterns are similar and keep the results to the nearest centimetre for precision.

Here is the apparatus I chose to use and the set-up of experiment:

The method I will use is:

- First set up equipment as shown in diagram
- Fill a tube with pondweed and water.
- Turn on the lamp pointing at the tube.
- Measure the light intensity using the light metre

- Then count the amount of bubbles produced in a minute
- Next I must count the amount of bubbles collected and measure the total.
- Repeat for each light intensity stage.
- For the second method I will do steps 1-3
- I will then wait until 1 minute is up, and disconnect the tube from the plant, so no more bubbles travel down the tube
- I will pull back the nozzle on the syringe to move the bubble along the tube, so that I can measure the length of the bubble.
- Conduct experiment 3 times.

My Results were measured with 3% CO2 and at 25° Centigrade. They are:

LIGHT INTENSITY	PHOTOPYNTHESIS
100	10
100	9
100	10
90	8
90	9
90	8
80	5
80	8
80	8
70	4.5
79	4
70	4
60	2
60	2
60	2
50	0
50	0
50	0
40	0
40	0
40	0

AVERAGES					
100	90	80	70	60	50

10	8	6.8	4.5	2	0

Evaluation

My experiment went very well, and has allowed me to prove my hypothesis that the greater the light intensity, the faster the rate of photosynthesis, until another limiting factor is there.

To improve my experiment I would have to do it in a more controlled environment, as there were more than one group of people doing the experiment so the temperature in the room varied a bit from people walking in and their body heat making the temperature go up and down. So the results could have been more accurate if the whole experiment had a set temperature that didn't change. I also need to find a way around the problem, of oxygen being released/ used without any physical affect that I can record.

Looking at my graphs the pattern it goes up in a straight line I believe that my results are correct. Also the line of best fit in both graphs goes through nearly every plot on my graph making my results seem almost perfect.