Biology Coursework

Light Intensity and The Rate Of Oxygen Output

Aim

The aim of my experiment, which is investigating Light Intensity on a piece of Canadian pond weed, is to find out and investigate whether or not changing a variable of the pond weed will affect other variables such as
; The plants rate of oxygen output
; The effect on the plants photosynthesis
In my experiment I am going to change one variable which will be light intensity.

Prediction and Background Knowledge

I predict that as the light Intensity increases so will the rate of oxygen output. I know this will happen because plants need light for photosynthesis. The following formula represents photosynthesis:

Carbon Dioxide + Water $\xrightarrow[\text{Chlorophyll}]{\text{Sunlight}}$ Glucose + Oxygen

I know by this formula that as one of these variable changes and it gets bigger, so to will the end result, which in my case will be oxygen, bubbles.

We know that the four things that are needed for photosyn thesis to happen are: Light, Chlorophyll, Carbon dioxide and Water. By changing one of these we can make photosynthesis happen quicker or slower. I am going to change the amount of light the plant is given to see if this affects the oxygen output.

Also if the source of light is nearer to the Elodea the plant will photosynthesis a lot quicker, as we know that the closer the light source the quicker it will produce oxygen bubbles. Therefore I will try to prove this right when I have done my experiment and ge t all the results that I need.

My preliminary test is to see if anything should be changed before we do the real test.

Preliminary Results

Distance of light from Elodea (cm)	Oxygen bubbles which are released
10	22
20	18
30	16
40	14
50	13
60	10
70	7
80	6
90	3
100	1

I did my preliminary test, and as you can see quite a lot of oxygen was produced. I turned the light on at each distance for 60 seconds. I added a light layer of sodium hydro-carbonate on a spatula and put it in a beaker that contained the Elodea and the water. I did not think that the sodium hydro-carbonate made a difference, as it did not make my results any better than they would have been without it, so I will not use it in my final experiment. This experiment was very useful and I have learnt a lot from it and changed some variables.

Method

Apparatus List

1. 500ml Beaker
2. A piece of Canadian pond weed
3. A lamp
4. A test tube
5. A light and temperature metre

Apparatus diagram

Step by step

Step 1; First of all, you need to get all the apparatus, which I have listed. And then all you have to do is arrange the apparatus like, it is shown above in the diagram.

Step 2; Put the lamp 10cm away the beaker, which contains the Canadian pondweed. Now get a stopwatch time 60 seconds from when the lamp is switched on and then switch the lamp off.

Step 3; Count how many bubbles are released within the 60 seconds that the lamp was turned on, and measure the light and temperature on the metre.

Step 4; Keep on going, by placing the lamp a further 10cm away each time. Keep on going until you get to 100cm away, now you have got all the data and information which is required.

Step 5; Pack all the apparatus away.

Fair Test

To make my experiment a fair test there will be a number of things that I must carry out. The first thing is to turn off all the lights in the classroom and close all the blinds so that no light can get into the room. I must use the same lamp all the time and also use all the same pieces of equipment to make sure that I perfectly go back by 10 centimetres. Each time I will be using a 1-metre ruler to make sure that my lamp goes back the same distance each time. I must have the same room temperature throughout, as a different room temperature will affect the oxygen bubbles output. Everything that we do must be the same. All of these combined into this experiment will make it a fair and accurate test.

Safety

To make sure this experiment will be safe, you should:

- Make sure that the apparatus is set up in the way it should be so that none of the pieces will fall off and break
- Make sure that nobody in the group touches the lamp as it will be hot and would cause injury
- You should also wear safety goggles as if a beaker were to dr op and smash some glass could go into your eyes
- Beware of broken glass
- Wash your hands after touching the Elodea

Results

Distance	Light Intensity	Time (seconds)	Temperature	Oxygen bubbles
10	1950	60	20	15
20	770	60	20	11
30	400	60	20	10
40	280	60	20	9
50	190	60	20	8
60	170	60	20	8
70	150	60	20	7
80	135	60	20	7
90	120	60	20	5
100	105	60	20	4

Conclusion

The prediction that I made was "I predict that as light intensity increases so will the rate of oxygen output". This was proved right when I did my experiment and obtained enough evidence to support my prediction. You can see by my results and evidence that the higher the light Intensity the more oxygen bubbles which are released within a minute.
I knew this as if you increase one of the variables then the end result would change. This is the formula:

$$\text{Carbon Dioxide + Water} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Glucose + Oxygen}$$

All that I changed was the amount of light that the plant received from certain distances, that will cause the amount of oxygen bubbles to differ.

Evaluation

I think that the quality of my evidence was to a very high level, but there are many ways in which I could have improved my experiments, therefore improving my results. There was only one anomaly in my graph. I do think that this was a mistake because you cannot be 100% sure that you have counted all the bubbles, which have been released from th e Elodea within the certain time period. That is why I think I got my one anomaly but all the other results on my graph flow in a good direction and I have a very good line of best fit. I think that in some ways I could have made my results and experiment more accurate. To start off with I could have been more thorough with making sure that no light came in through the blinds - as this is very important. Also I might not have been accurate with counting the amount of bubbles, which was released each minute. A way to improve this is to have more than one person viewing the experiment and then making an average of how many oxygen bubbles were counted. When we took the temperature and light intensity we could have taken it more than once in 60 seconds, as when we took it once it may have been either rising or falling. If we had taken it twice we could have got the average and got a more accurate result. I think that if all of these corrections would have been met in the experiment I would have a lot more accurate results.

I think that my results and evidence based on my experiment are good enough to support my prediction.