Rate of Photosynthesis

Planning

Introduction

Photosynthesis is the process whereby plants and certain photoautotroph make food using carbon dioxide and water. When both (carbon dioxide and water) are combined, they make the food; glucose as well as oxygen, given off as a by-product. The above description of photosynthesis can be analysed in the equation below:

BALANCED CHEMICAL EQUATION

$6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2$

WORD EQUATION

Carbon Dioxide + Water=Glucose + Oxygen

Factors that affect photosynthesis:

LIGHT: insufficient light slows down the rate of photosynthesis

CARBON DIOXIDE: similarly, inadequate quantity of carbon dioxide slows down the rate of photosynthesis.

TEMPERATURE: temperature should not be too cold nor too hot.

Aim

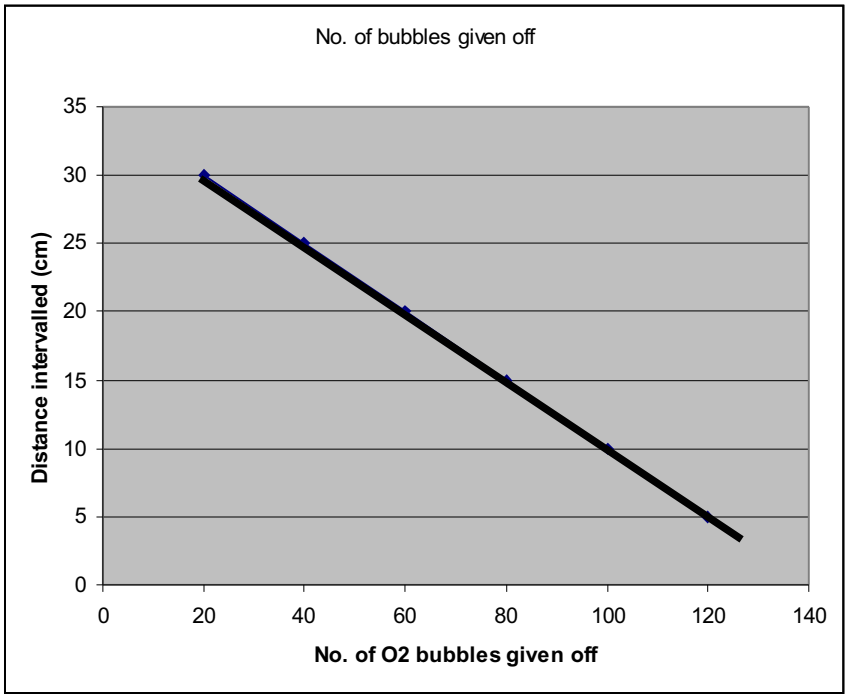
My aim is to investigate whether the factor 'light', has an affect on the rate of photosynthesis. This will be observed by counting the number of oxygen bubbles given off.

Apparatus

- Metre rule
- 5cm Canadian pondweed clipped on a paperclip
- Beaker
- Lamp, with 60 watts bulb
- Water

Hypothesis

It is predicted that, the more light intensity the higher the rate of photosynthesis, providing that the temperature is not too cold or too hot. I would try and expect the below graph:



Method

The most vital thing, which is needed for photosynthesis is a plant. The plant which will be used in this investigation is a Canadian pondweed. The following is a step by step account which I will take:

1) Make sure that the place is safe by making sure that there are no obstacles on the floor like a bag
2) The room must be kept dark, so that excess light don't enter the beaker apart from the lamp's light.
3) The paper clipped Canadian pondweed will be placed in the beaker full of water.
2) The lamp must be kept 20cm away from the beaker and then switched on.
3) I will wait for two minutes and count all the number of bubbles released.
4) My results shall be recorded
5) Steps 1-4 will be repeated at 40 cm… and finally 120 cm from the beaker.

Safety

Observation
I carried out this experiment safely. The lab, was kept free from the dangers of water spillage as I had used electricity for the lamp. Bags were also removed from the floor and hanged on hangers which prevented from toppling over.

The table below is the result collected:

Distance intervalled (cm)	No. of O2 bubbles given off
20	25
40	21
60	18
80	15
100	13
120	10

The above are the results I have collected throughout the experiment. All the results above cannot be very reliable as I haven't repeated the experiment and doing so will be a waste of time. However, I will get results from two colleagues so that I can compare they're data with mine. They also used 5cm Canadian pondweed clipped on a paperclip and a lamp, with 60 watts bulb. The table below are my colleagues's result:

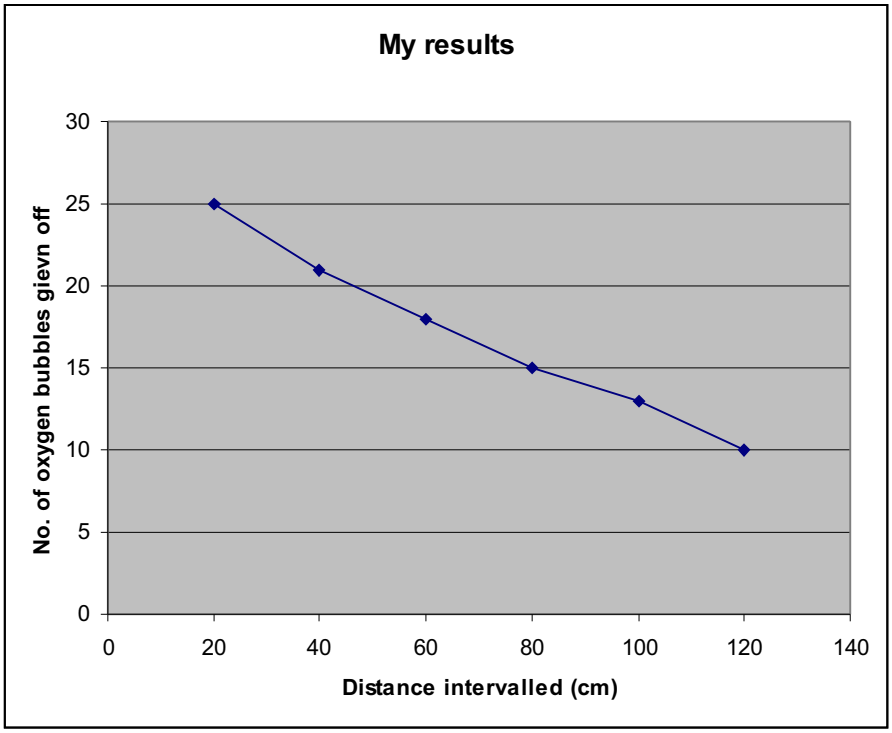
Colleague 1

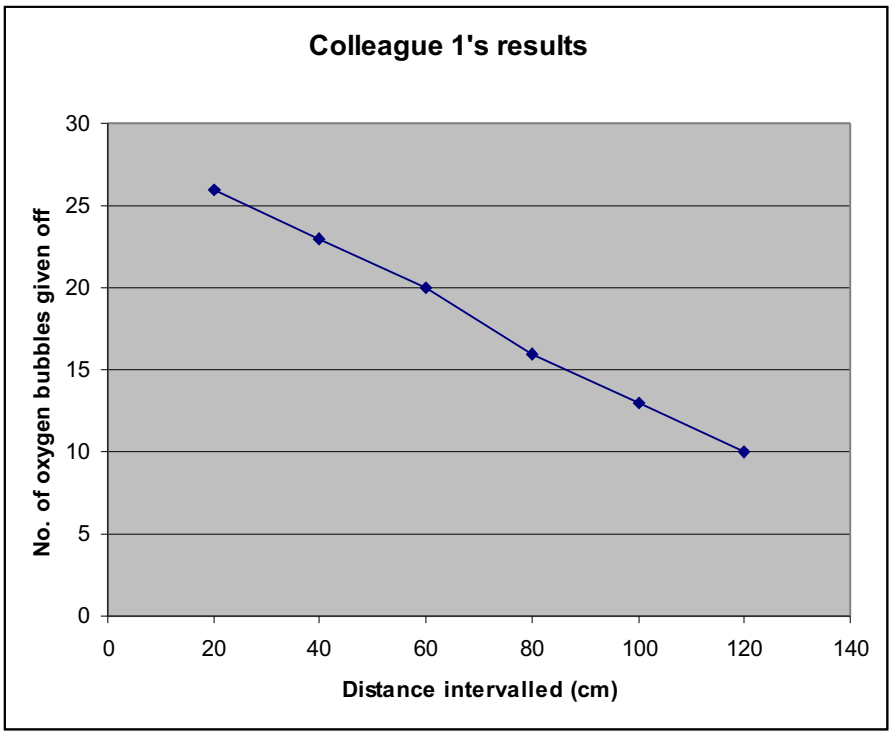
Distance intervalled (cm)	No. of O2 bubbles given off
20	26
40	21
60	20
80	16
100	13
120	10

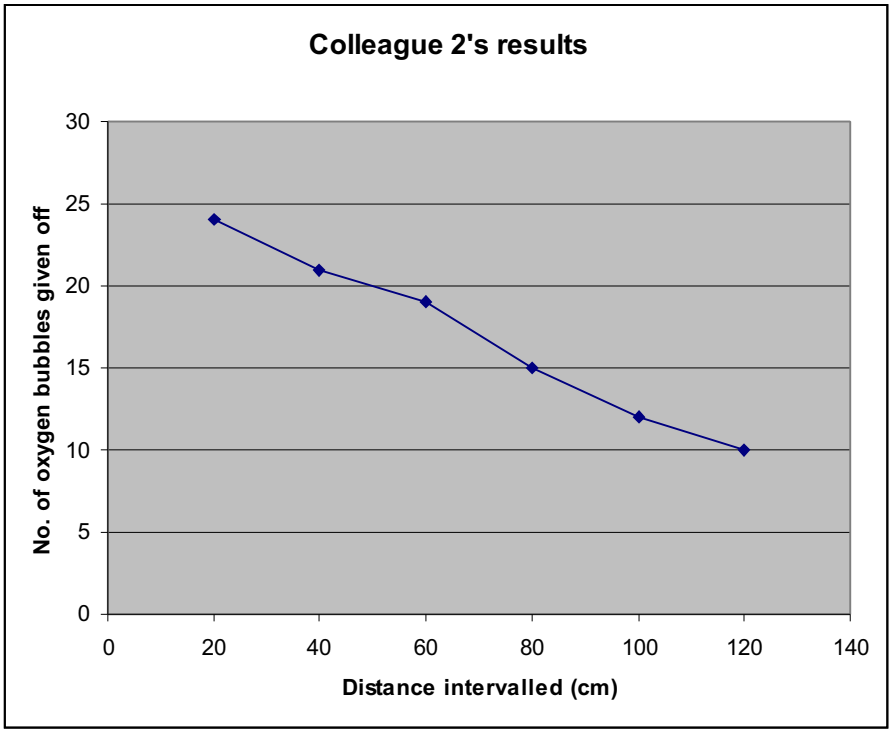
Colleague2

Distance intervalled (cm)	No. of O2 bubbles given off
20	24
40	21
60	19
80	15
100	12
120	10

The above results can be represented as line graphs to see if there were any anomalies.





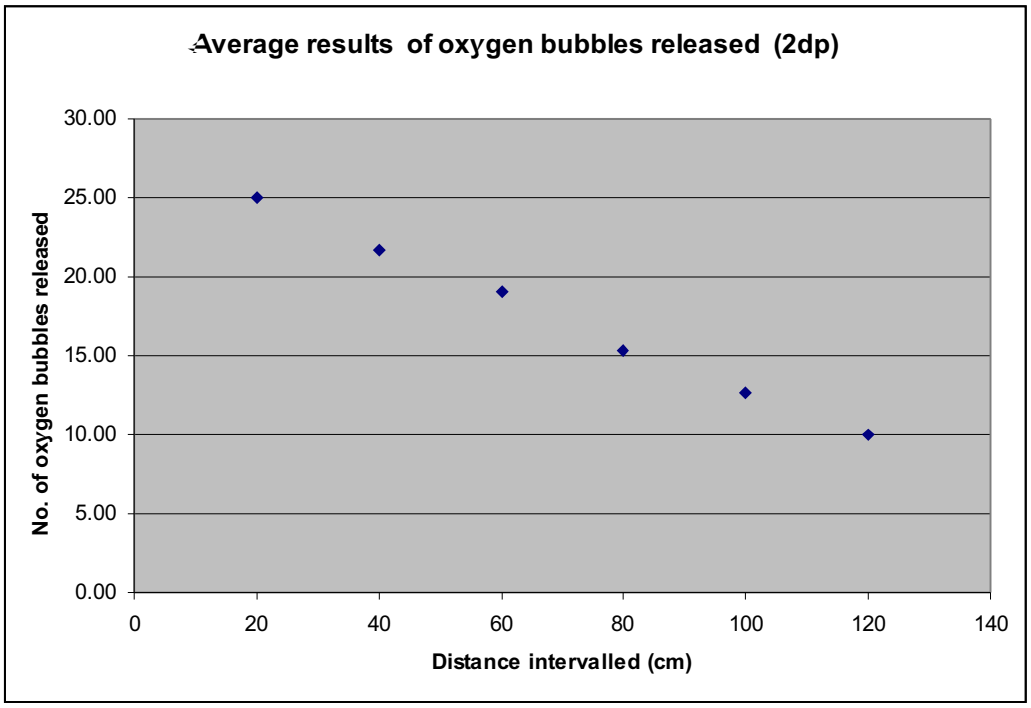


The graphs almost look alike, suggesting that there were no anomalies and ultimately my results are very reliable.

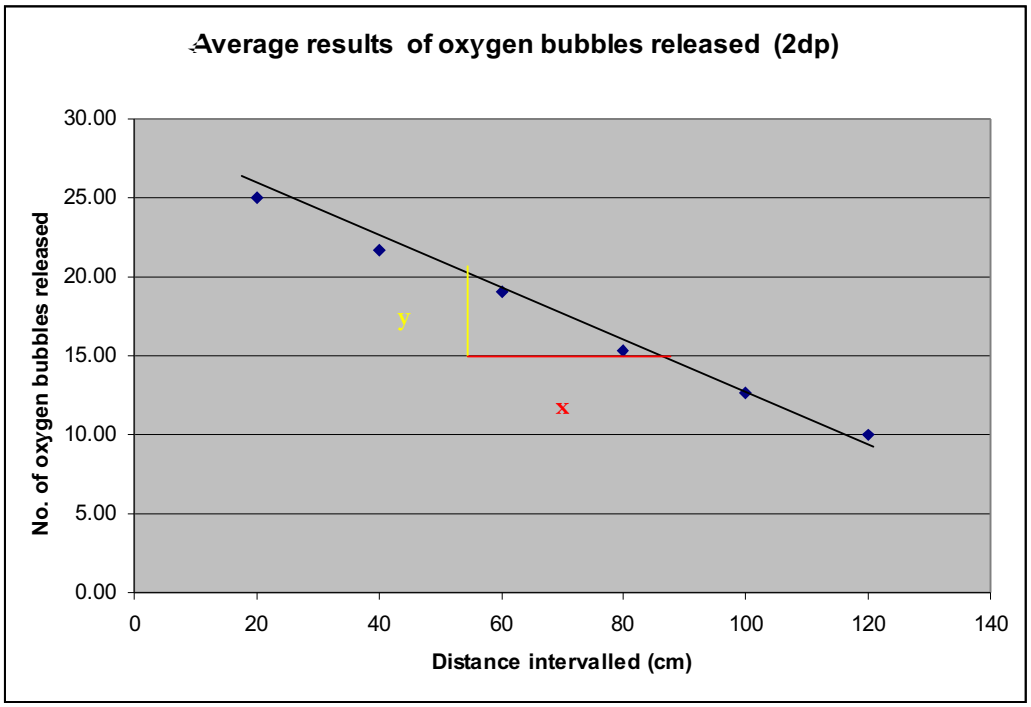
Analysis
By using the above results, I will combine them into a table and work out the average.

Distance intervalled (cm)	My results of oxygen bubbles released	Colleague 1's results of oxygen bubbles released	Colleague 2's results of oxygen bubbles released	**Average results of oxygen bubbles released (2dp)**
20	25	26	24	**25.00**
40	21	23	21	**21.67**
60	18	20	19	**19.00**
80	15	16	15	**15.33**
100	13	13	12	**12.67**
120	10	10	10	**10.00**

Using the 'Average results of oxygen bubbles released (2dp)', I will construct a scatter graph



This scatter graph shows that, as the distance from the lamp increased, the number of bubbles released from the Canadian pondweed increased also. This is very similar to the hypothesis made earlier: '*the more light intensity the higher the rate of photosynthesis, providing that the temperature is not too cold or too hot'*. The temperature of the room was of course not too cold or too hot. The pattern which can be noted is that, points are lowering as the lamp is distanced away from the Canadian pondweed. This proves that my prediction is correct.



In order to find the gradient of the graph, I have placed a **line of best fit.** I will need to find the value of y and x and then divide y by x to acquire the gradient. The value of y is 5 bubbles and the value of x is 20cm. 5/20=0.25. 0.25 is the gradient. Finding the gradient can now help me to find the value of any given distance (cm).

Evaluation

My method was a suitable one but yet there were many satisfactory notes regarding it. The reason why it was suitable because this experiment was a successful one. However, the satisfactory notes are that my results could have been more accurate, by using another colleague's results thus increasing the chance of accuracy. As well as that, this experiment could have been improved. The ways of improving it was, collecting the whole result using sensors and data could have been recorded by a computer as this would have given very accurate data and it does not include human interference i.e.: results would have been collected automatically by a computer. This however was impossible due to insufficient funds.

I could have extended this investigation, to see the other variables affecting the rate of photosynthesis i.e.: temperature, carbon diocide.