

Planning

Title: Investigate the effect of light intensity on the rate of photosynthesis.

The aim of my investigation: To find out how does the amount of light effect the amount of photosynthesis.

The variables that affect photosynthesis are:

- ❖ Light intensity
- ❖ Carbon dioxide
- ❖ Water
- ❖ Temperature
- ❖ Chlorophyll (the size and the shape of the leaves)

The only factor I will change is light intensity because I want to investigate the effect of light on the amount of photosynthesis so if I want to get a correct result I should keep the other variables constant and just vary the light.

To make sure my investigation is safe I took care not to touch the hot lamp. I also made sure that the lamp did not touch the water.

Photosynthesis is the process that allows green plants to produce their own food. For this process to occur energy is needed in the form of sunlight. Chlorophyll absorbs the sunlight and is found in the chloroplasts of green plants. The light energy is used to convert Carbon Dioxide and water into sugars. The sugars are the plant's food and oxygen is the waste products. Photosynthesis takes place in a number of stages but this is the equation for the whole process:



In order to obtain **reliable evidence** I will need to measure the rate of photosynthesis at 10cm intervals between the plant and the source of light.

I will need the following **apparatus** for my investigation:

- ❖ Elodea plant

- ❖ Beaker of water



❖ *Lamp*



❖ *1m ruler*



❖ *Stop watch*










❖ *Test tube*



❖ *Filter funnel*

Method:

1. *Set the equipment as shown in the diagram*
2. *Put the lamp 100cm away from the plant*
3. *Count the number of oxygen bubble produced in 1:00 minute*
4. *Every minute move the plant away from the lamp these distances*

<i>1st min</i>		<i>5cm away</i>
<i>2nd min</i>		<i>10cm away</i>
<i>3rd min</i>		<i>15cm away</i>
<i>4th min</i>		<i>20cm away</i>
<i>5th min</i>		<i>25 cm away</i>
<i>6th min</i>		<i>50cm away</i>
<i>7th min</i>		<i>100cm away</i>
5. *Record the results in the table*

*I have used information given to me about photosynthesis in my **science lessons** and information from **GCSE science textbook** to help me **plan** my investigation. I could also have information about photosynthesis on the **Internet**.*

Prediction:

I predicted that:

- ❖ *The rate of photosynthesis will be higher as the lamp get closer to the plant*
- ❖ *When the lamp is far from the plant the rate of photosynthesis will be lower and less bubbles will be produced*

This means the higher the light intensity the greater the rate of photosynthesis.

Light energy is used by plants to convert carbon dioxide and water into sugars. Sugars are the plants food and oxygen is the produced as a waste product. Therefore the more light there is, the more sugar will be produced and so the more oxygen will be visible in the form of bubble. This will show that photosynthesis happening at faster rate. This is why what I predicted will happen.

Obtaining the Evidence

Analysis Evidence:

I use the method as discussed in my plan without any modification to it, to obtain the results written in the table shown below.

My results were:

<i>Distance of lamp from weed</i>	<i>Average number of bubbles in 1 minute</i>	<i>Number of bubbles in 3 minutes</i>
<i>5cm</i>	<i>78</i>	<i>234</i>
<i>10cm</i>	<i>74</i>	<i>222</i>
<i>15cm</i>	<i>56</i>	<i>168</i>
<i>20cm</i>	<i>43</i>	<i>128</i>
<i>25cm</i>	<i>28</i>	<i>84</i>
<i>50cm</i>	<i>11</i>	<i>32</i>
<i>100cm</i>	<i>5</i>	<i>15</i>

Analysing the Evidence and Drawing Conclusions from my Investigation

I have chosen one or more of the following ways to organise the data from my result table produced in my investigation.

A pie chart

A bar chart

A diagram

A Line Graph

Calculation(s)

Other (I will give details below)

Theses ways are attached on separate sheets.

From processing the results, using the method indicated above, I have discovered that the rate of photosynthesis is affected by light intensity. The greater the light intensity, the greater the rate of photosynthesis.

As the plant was moved further away from the lamp the amount of bubbles got less. This showed that photosynthesis was happening at a slower rate.

The results show that the amount of oxygen bubbles produced goes down in direct relation to reduction in the light intensity. The line on the graph declines steadily.

When the weed was 5cm, away from the lamp there were 78 bubbles produced in 1 minute.

When the weed was 10cm away from the lamp there were 74 bubbles produced in 1 minute.

At a distance of 15cm, 56 bubbles were produced in 1 minute.

At 20cm, 43 bubbles were produced in 1 minute.

At a distance 25cm, 28 bubbles were produced in 1 minute.

When the weed was 50cm, away from the lamp 11 bubbles were produced in 1 minute.

At a distance 100cm, 5 bubbles were produced.

These patterns and results can be explained from my understanding knowledge that light intensity affects the amount of food or sugar which can be produced by a plant.

These conclusions were the ones that I had predicted in my plan. I had said, in my plan that the higher the light intensity the greater the rate of photosynthesis.

My results show that my prediction was correct.

My results match the predictions because I made sure that I carried out a fair test. I only changed the variables I was investigating (light). I based my prediction on the scientific theory of photosynthesis.

Evaluating the Evidence from My Investigation

*I think the investigation **did work out well** because the equipment was set up correctly; it was a fair test; I measured my results carefully; and I recorded my results accurately in the table.*

There were no anomalous results.

I can propose the following improvement improvements and/or further work, to proved additional evidence for my investigation and perhaps to extend the enquiry.

- ❖ *I would repeat the experiment several times to make sure my results were correct.*
- ❖ *I could extend the enquiry by using different types of plant.*
- ❖ *I could be more careful in counting the oxygen bubbles by having a partner to help me count and check we got the same results.*

Analysis:

I found out that the further away you go from a tree the more grass you will find. If a catalyst is added to something it makes it quicker. There is more sunlight away from the tree which makes photosynthesis occur quicker. The tree branches and leaves prevent a lot of sunlight to go to the grass which makes the process slower. As you can notice on the graph the point where grass is 1 metre away from the tree has less coverage of grass than the one that is 10 metres away.

Evaluation:

My investigation was fair because I used the same tree in the same time of year and the same quadrates. I placed the pen in the same position. Also there was only one tree in the place I was doing my experiment in. It was accurate because I took two readings for each distance then calculated the average

On the graph you can notice some anomalous points circled. This is because either:

- ❖ *Human error*
- ❖ *the measurements were not accurate*
- ❖ *I did not check the squares properly (to see if there is coverage of grass or not)*

If I do this experiment again I will take more readings. My prediction was "There will be more growth of grass further away from the tree than nearer the tree". There is more sunlight away from the tree which makes photosynthesis occur quicker. The tree branches and leaves prevent a lot of sunlight to go to the grass which makes the process slower. The more you add a catalyst the quicker the reaction will be. The sunlight and the chlorophyll are the catalysts in this process. So the more the sunlight the quicker photosynthesis occurs. This supports my prediction.

Photosynthesis can be carried in further experiments for example Light reaction, dark reaction or artificial photosynthesis.

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