

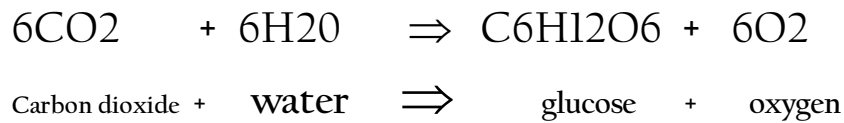
Experiment to investigate the effect of light on the organic plant elodea.

Aim: To calculate the rate of photosynthesis from the number of oxygen bubbles produced by the plant.

Photosynthesis: The process by which green plants use the sun's energy to build up carbohydrate reserves.

Plants make their own organic food such as starch. Plants need Carbon dioxide, water, light and chlorophyll in order to make food; and starch and oxygen are produced. Carbon dioxide and water are the raw materials of photosynthesis.

The equation of photosynthesis is:



Green plants need sunlight. They use the light energy to make a sugar called glucose.

Glucose can be turned into another type of sugar called sucrose and carried to other parts of the plant in phloem vessels. Glucose can also be turned into starch and stored. Both starch and sucrose can be converted back into glucose and used in respiration.

Photosynthesis happens in the mesophyll cell of leaves. There are two kinds of mesophyll cells – palisade mesophyll and spongy mesophyll. The mesophyll cells contain tiny bodies called chloroplasts which contain a green chemical called chlorophyll. This chemical is used to catch the light energy needed in photosynthesis.

They take carbon dioxide from the air. Plants use sunlight to turn water and carbon dioxide into glucose. Plants use glucose as food for energy and as a building block for growing. The way plants turn water and carbon dioxide into sugar is called photosynthesis. That means “putting together with light”

During the winter, there is not enough light or water for photosynthesis. The green chlorophyll disappears from the leaves. All plants need light in order to photosynthesise. Photosynthesis can only occur in the presence of light.

Hypothesis: The brighter the light intensity the more bubbles that will be produced. As the light is increased so would the rate of photosynthesis.

Apparatus: boiling tube, 250ml beaker, bench lamp, ruler, sodium hydrogen carbonate, pipette, elodea, tally counter and a stopwatch.

Method:

- ♣ Put the pondweed in the boiling tube with the pondweed water in it that it was taken from covering in because the plant is not used to tap water.
- ♣ Put the boiling the tube in a 250ml beaker filled with cold water and shine the bench lamp on it.
- ♣ Leave it for about 5 minutes so it can adjust to it's new surroundings

- ♣ Using a spatula sprinkle a bit of sodium hydrogen carbonate into the boiling tube to provide carbon dioxide for the plant.
- ♣ Take the temperature of the plant by placing the thermometer into the beaker to see if the elodea is at a temperature where it would not be affected by enzymes .
- ♣ Count the bubbles at one-minute intervals as they appear using the tally counter to record the results.
- ♣ Repeat the experiment but moving the bench lamp 5cm away each time after 1 – minute intervals to make it a fair test.

Preliminary results:

Time in minutes	Distance of lamp (cm)	Amount of bubbles
1	5	34
2	10	128
3	15	192
4	20	161
5	25	111

Table of results to show how many bubbles were produced per minute at 32°

1.

Time in minutes	Distance in cm	Amount of bubbles produced per minute
1	5	82
2	10	79
3	15	73
4	20	67
5	25	61
6	30	50
7	35	41
8	40	38

2.

Amount of time in minutes	Distance in cm	Amount of bubbles produced per minute
1	5	150
2	10	104
3	15	100
4	20	97
5	25	85
6	30	47
7	35	43
8	40	31

3.

Amount of time in minutes	Distance in cm	Amount of bubbles produced per minute
1	5	94
2	10	87
3	15	76
4	20	61
5	25	52
6	30	37
7	35	21
8	40	15

Averages for the results of the experiment:

Experiment 1: 61.3
Experiment 2: 82.1
Experiment 3: 55.3

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Averages for each measurement in the experiment:

5	108.6
10	90
15	83
20	75
25	66
30	49.6
35	35
40	28

Analysis: The rate of photosynthesis increases as the light intensity increased. This is because photosynthesis is a reaction, which needs energy from light to work, so as the amount of energy available from light increased with the rise in light intensity, so did the amount of oxygen produced as a product of photosynthesis.

My graphs showed the relationship between the light intensity and the rate of photosynthesis was non linear. In the very first part of the graph, the increase in rate is proportional to the increase in light intensity. I can say that an increase in light intensity does increase the rate of photosynthesis.

My preliminary experiment was not accurate enough to justify being used as my main experiment because I was depending on all the bubbles to be the same size, which they were not. Anomalous results could also have been caused by my counting at a certain angle that would not allow me to see every single bubble as they rose to the surface or the bubbles could have been caught up in the leaves giving us an underestimate of bubbles produced.

Using a tally counter helped to count the amount of bubbles that rose. It was a better method than plotting dots on a piece of paper every time a bubble rose because a dot may be accidentally put on top of another. The graphs showed that the further away the light the less bubbles were produced. To get a better graph or set of results the experiment could have been tested.

The results could be like this because the plant could have run out of carbon dioxide.

Another error could have been the distance between the light source and elodea were not measured to a high degree of accuracy.

Overall I think the experiment went well and although the results varied it turned out ok!

